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ART IN INDUSTRY THROUGH THE AGES

Monograph Series on Southern India/Madras Presidency

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ART IN INDUSTRY

THROUGH THE AGES

Vol. III

MONOGRAPH SERIES ON MADRAS
PRESIDENCY/SOUTHERN INDIA

NAVRANG
NEW DELHI-110012 (INDIA)

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PUBLISHERS' NOTE

A number of monographs on various indigenous handicrafts and industrial products were prepared in Madras Presidency/Southren India on the directions of the Government of India contained in their circulars of 1895 and 1897. These monographs have been based on the district reports or monographs and were supplemented by other published information and personal observations of the authors. All the monographs on different products trace the historical growth of these industrial arts, depict the economic conditions of the artisans engaged therein, describe the product they made and artistic aspects thereof as prevailed at the close of the nineteenth century. These monographs appeared in print at the turn of the century.

It was proposed to reprint all the monographs in one volume. The original monographs however, were not published in the same page size or print. So in order to reprint them in one volume, some of the monographs had to be 'reduced' or 'enlarged', as a result of which, the size of the final print could not be uniform.

New Delhi-12
1982

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The Silk Fabric Industry of the Madras Presidency.

AS it was impossible that I should make a special personal visit to all the important centres at which the silk-weaving industry is carried on; and, further, as the weavers are inclined to view me with suspicion as being one of the "Gentlemen from England, who have come to copy their designs by machinery," I have had recourse, in the preparation of the present monograph, to the following circular letter addressed to the Collector of each of the 22 districts of the Presidency. In this way, it seemed to me, I should best arrive at the present condition of the industry, and the views of the weavers thereon.

To

ALL COLLECTORS.

With reference to G.O., No. 4873, Mis., dated 10th December 1898, on the subject of a monograph on the silk-industry of the Presidency, which I have been asked to prepare, I shall be very grateful if you will assist me with information, so far as this industry is carried on in your district.

2. The main points, on which I am desirous to collect information, are as follows:—

(*a*) The caste or castes to which the weaving community belongs.
(*b*) Whether females, as well as males, are engaged in the industry.
(*c*) The localities at which the industry is carried on.
(*d*) The number of looms and weavers at different centres.
(*e*) The condition of the industry, whether flourishing or declining; and, if the latter, the causes to which the artisans attribute the decline.
(*f*) The nature of the fabrics made, and by what classes (Muhammadans, Hindus, etc.), they are purchased.
(*g*) The market in which the fabrics are sold, *e.g.*, whether the trade is local within the district, or spreads beyond its limits.
(*h*) From what place or places the silk is obtained.
(*i*) The method of preparation for weaving in the loom.
(*j*) The nature of the dyes used (vegetable, mineral, etc)., and method of preparation of the indigenous dyes.
(*k*) The reason why aniline and alizarine dyes, if used, are preferred to vegetable colours.

3. It would help me very considerably if it could be arranged that typical samples of the woven fabrics (with price recorded) should be sent to me for inspection, and, if of good quality or design, purchase for the industrial section of the museum.

4. Though the matter is only indirectly an official one, I take advantage of the present opportunity to state that money prizes, or medals, and certificates of commendation, will be offered at the next Fine Arts Exhibition at the end of the present year or beginning of 1900, for fabrics woven in silk, or silk and cotton mixed. And, if the weavers are willing to advertise their wares, I shall be glad to receive for competition, and possible purchase by visitors to the exhibition, specimens of their best work.

The replies received in response to this letter are incorporated in the following notes. From six districts—Vizagapatam, Cuddapah, Tinnevelly, Malabar, South Canara and Nilgiri—it is reported that no silk-industry is carried on therein. "In 1700," Sir George Birdwood writes,[1] "a law was passed, by which all wrought silks, mixed stuffs and figured calicoes, the manufacture of Persia, China, or the East Indies, were forbidden to be worn or otherwise used in Great Britain. It was particularly designed for the protection of the Spitalfields silk manufacture, but proved of little or no avail against the prodigous importation and tempting cheapness of Indian piece-goods at that time." Two centuries exactly have elapsed since the passing of this law, and the dawn of a new century finds the Indian weaver, without capital, and using a primitive hand-loom, being ousted from his hereditary craft by the "prodigious importation and tempting cheapness" of piece-goods[2] (many with debased Indian or Persian design) turned out in Europe under all the advantages of skilled knowledge of the manufacture and manipulation of mineral dyes, and quick outturn in power-looms in their favour.

In connection with the decline of the indigenous weaving industry, I may revert to the concluding paragraph (possibly Utopian) of my 'Monograph on the cotton fabric industry of the Madras Presidency,' 1897, when I wrote as follows: "Admitting the hopelessness of any attempt to entirely arrest the importation of these (piece-) goods, it nevertheless seems to me that the Madras Government School of Arts might, with a change of

[1] 'Industrial Arts of India.'

[2] The term "piece-goods," now familiar to us in connection with imported fabrics, was originally applied in trade to the Indian cotton fabrics exported to England.

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policy, prove a great influence for good, and that it should take an active lead in a serious effort to bring about an improvement in the colour and design of imported fabrics, and an amelioration of the condition of the native weavers and dyers, who, as hereditary artisans, are worthy of our sympathy and support. State interference with existing trade concerns is, I am fully aware, not wholly unattended with difficulties, to overcome which would require careful steering by one gifted with tact, and able to win the confidence of the commercial community (Europeans and Natives) interested in the piece-goods trade. Ample material is available as a guide to the production of suitable design and colour in their relation to cotton fabrics for native wear; and a serious effort should, it seems to me, be made by the School of Arts and Industries to check at least the production of the most glaring barbarisms in colour-printed fabrics, by the preparation and wide-spread distribution of patterns, carefully selected as regards colour and design, with a view to guiding both the designers and manufacturers into a better path." In evidence of the difficulties against which the weaving community has to contend, I may quote the remarks of Mr. E. B. Havell, formerly Superintendent of the Madras School (now of the Calcutta School) of Arts (Report on Industrial Tour, 1885) who says: "The great objection among Hindus to European long-cloth, apart from its want of durability, is that the coloured and embroidered border of the native cloth is wanting; so, on occasions of ceremony, the native cloth is still used. But, within the last year or two, cloths have been introduced into the market exactly similar in outward appearance to the common country bordered white cloth, and selling at two-thirds the price or less. Even the finer cloths with silk-embroidered borders, which, on account of the combination of silk and cotton being difficult to work by machinery at a cheap rate, have hitherto escaped the competition of cheap and vulgar imitations, are now being reproduced with borders of coloured cotton exactly similar in design. Similarly the women's cloths have until recently only had to compete with glaring printed cottons, which, though injuring native trade in cloths for low-caste wear, cannot have affected the industry in the finer manufactures. But lately European cloths, woven instead of printed, in imitation of some of the Kuttálam and Kuranád patterns, have been brought into the market, selling at prices with which the native manufacture could not possibly compete. The effect of this new departure will no doubt tend to greatly hasten the decline in native weaving. In fact, it is obvious that, in no very short time, the whole of the native industry in the low-caste or purely cotton cloths must give way, and only a remnant of the finer manufacture, in which silk is partly or wholly used, will be able to hold its own to any extent against the cheaper, though vastly inferior in every way European goods."

The sericultural industry is at the present day threatened by a rival to the silk of the silk-worm in the form of artificial silk, the industrial significance of which may be gathered from the number of patents which have been taken out, during the last year or two, for improvements in, and appliances for mercerising and imparting a silky lustre to web-fabrics. As bearing on the subject of this artificial silk, the opening sentences of an address[1] by Mr. Adam Millar to the Society of Chemical Industry may be quoted: "Silk," Mr. Millar says, "possesses greater strength than any other textile filament, but its principal value is not its strength: it has a lustrous surface, and this is its most valuable characteristic, and all attempts to obtain a substitute for it aim at reproducing this lustre. Another character of silk is the long length and fineness of the individual filament. This is indirectly a very valuable quality, for it allows of very fine threads to be formed, and of such strength that no other fibre can approach; so that its exceptional strength is of great value indirectly in giving a thread of good working strength, ten times thinner than cotton or wool. Thus a pound of silk yarn can be used to cover such a large surface of warp that its high price per pound does not prevent its application to many purposes, when a mere surface covering is chiefly wanted, and strength or durability is of less moment. Another outstanding quality of silk is the wide range of brilliant colours which may be imparted to it, and this quality must be present in any successful substitute.

"Within the last few years a purely artificial filament has been produced from cellulose, and this product, in spite of its being rather dear, rather difficult to dye, and very deficient in tensile strength, has been found to be of great value for many textile purposes, where its splendid lustre has outweighed its serious defects." Mr. Millar then proceeds to describe a process for producing artificial silk from gelatin, which he claims to possess very considerable advantages over cellulose, especially in its more economical production.

As bearing on the general condition of the weaving community (both cotton and silk), the following extracts from the 'Report of the Famine in the Madras Presidency, 1896–97,' may be quoted:[2] "Among the people who felt the distress at the beginning were the weavers. About a third of the total number of weavers in a taluk, according to the census returns, may be taken to belong to the Mala community. Leaving

[1] *Vide* 'Journ. Soc. Chem. Ind.,' January 1899, pp. 16–59.

[2] Letter from M.R.Ry. K. Vijaiaraghavacharier, Special Deputy Collector in charge of Weavers' Relief Operations, Deccan Districts.

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out the Mala weavers, the remaining professional weavers are made up of weavers, caste-men, and Mussalmans. The latter class weavers are found chiefly in the big centres of Mussalman population, such as Adóni, Kurnool, and Tadpatri. It is a well-known fact that the people of the weaver caste, as well as the Mussalmans, are generally improvident, and consequently poor. They are both accustomed to a better kind of food and drink than other classes of people of similar position in life. In favourable times the weavers generally earn fair wages. They, however, spend all they earn without caring to lay by anything, so that very few of their caste are in well-to-do circumstances. The same is the case with the Mussalman weavers. All these weavers are entirely in the hands of the sowcars[1], who make advances to them, and get cloths in return. The cloths thus obtained by the sowcars are exported to other parts of the country. It may be taken as a general fact that most of the professional weavers are indebted to the sowcars, and are bound to weave for them. So long as the seasons are favourable, and sowcars get indents for cloths from their customers, they continue their advances to their dependent weavers. But when, owing to any cause, the demand decreases, the sowcars curtail their advances proportionately, and the weavers are at once put to difficulty.

"According to the fineness and kind of fabrics turned out by the weavers, they may be divided into fine cloth weavers and silk weavers, and weavers of coarse cloths. It is the coarse cloth weavers that would be affected with the first appearance of distress. The consumers of their manufactures are the poorer classes, and, with the appearance of scarcity and high prices, the demand for the coarser kinds of cloths would cease. Such was actually the case about the beginning of the recent distress.

"The weavers are, as a class, not accustomed to hard manual labour, nor are they able to work exposed to heat and sun. If such people are put on earth-work, they would certainly fail to turn out the prescribed task, and consequently earn insufficient wages. They would thus be, as it were, punished for no fault of theirs. This state of things would last at least for some time, until the weavers got accustomed to earth-work. Again, these people have, by constant work at their own craft, attained to a certain degree of skill and delicacy, and, if compelled to do earth-work during the temporary unfavourable season, they would certain lose, to some extent, their skill and delicacy of hand, and would become unfit, in that degree, for their accustomed work when favourable season returns. They would thus be put to inconvenience doubly. During the first part of the distress their skill of hand and delicacy of constitution would stand in their way, and, after the return of good season, the loss of manual skill and delicacy would place them at a disadvantage. And what, after all, is the gain to Government? Practically nothing. On the other hand, it can be easily seen that giving relief to the weavers in their own calling is the most economical form of relief. In this form of special relief, Government advances materials to the weavers, to be woven by the latter into different kinds of cloths. Government has no doubt to incur a large initial expenditure in the shape of value of materials, and wages for weavers for making these materials into cloths. But all the materials are returned woven into cloths, so that, at the close of the operations, Government has a stock of cloths which can be disposed of without difficulty on the return of favourable times, and the cost incurred recovered. In this way Government not only administers relief to a pretty large section of its poor subjects, but keeps up, with little or no cost to itself, the industrial skill of this section of the people, and avoids the risk of adding to the already large agricultural and cooly portion of the population."

I am informed that, during the famine, relief was offered to the weavers at their own trade at Jammalamadugu in Cuddapah, Tadpatri in Anantapur, Adóni in Bellary, and Kurnool, as well as in a number of villages in these four districts and parts of Vizagapatam and Ganjám. Weaving was restricted to the manufacture of the commonest cloths, except at Adóni and Kurnool, where the carpet-weavers were employed in weaving carpets of simple pattern. The total amount expended on this form of relief was Rs. 11,54,707, and, at the close of the operations, the stock on hand was, in round numbers, 878,500 cloths and 79,600 carpets. Of the former, nearly the whole stock has been sold, only 4,000 remaining on hand in Kurnool and Bellary. Sales were effected with difficulty, and at a considerable sacrifice on the estimated value of the cloths; the difficulty being in part due to the almost continuous fall in the price of cotton during 1898. Of the 79,600 carpets, only 16,740 have as yet been sold. There is practically no local demand for them in Kurnool, and only a feeble demand in Bellary. Small lots are, however, enquired for from time to time, for despatch to the Northern Circars. The total amount recovered by sales so far has been Rs. 6,11,898, and the stock in hand may be valued at Rs. 40,000, but it is deteriorating by storage.

Trade statistics.—The following tables are based on an analysis of the figures in the Annual Statements of the Imports and Exports for the Port of Madras:—

[1] Money-lenders.

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1. IMPORTS—*Raw and Waste Silk.*

—	Calcutta.		Bombay.	Straits.	Japan.	France.	Brindisi.	Calcutta.	Japan.
	Raw.		Raw.	Raw.	Raw.	Raw.	Raw.	Waste.	Waste.
	LBS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.
1889	219,288	10,80,835	..	..	..	..	..	..	..
1890	234,710	11,75,998	..	..	..	..	..	3,200	..
1891	273,949	13,72,030	..	..	..	..	..	..	..
1892	242,377	12,22,828	..	..	2,250	180	2,256	..	9,060
1893	106,087	4,82,848	..	..	..	..	..	..	..
1894	105,309	5,21,785	7,944	..	..	..	..	..	..
1895	205,733	10,21,603	..	22,885	..	..	..	..	..
1896	278,728	13,92,140	..	..	..	..	..	..	..
1897	119,102	6,07,444	..	..	..	..	..	..	..
1898	65,825	3,33,634	..	..	..	..	..	..	..
Total ..	1,851,108	92,11,145	7,944	22,885	2,250	180	2,256	3,200	9,060

2. IMPORTS—*Piece-Goods.*

—	Great Britain.	Calcutta.	Bombay.	Rangoon.	France.	China.	Straits.	Trieste.	Hamburg.	Antwerp.	Genoa.
	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.
1889	27,212	14,852	1,664	..	3,594	2,530	80	..	..	..	500
1890	22,904	27,250	1,414	1,150	7,789	4,315	..	..	..	..	1,200
1891	27,515	4,973	473	450	3,948	..	..	..	2,097	554	..
1892	28,439	400	1,185	..	1,804	550	25	724	..	..	..
1893	28,423	11,960	2,400	1,080	5,066	..	..	..	..	..	..
1894	28,575	4,956	1,350	..	1,874	887	..	..	..	..	..
1895	42,045	2,400	1,900	..	713	..	..	..	..	..	..
1896	72,019	4,966	225	..	..	..	..	..	..	..	..
1897	57,717	5,700	1,200	..	..	..	5,446	..	..	..	..
1898	47,890	4,400	..	..	2,185	..	..	..	..	..	..
Total ..	3,82,739	81,857	11,811	2,680	26,973	8,282	5,551	724	2,097	554	1,700

3. EXPORTS—*Raw Silk.*

—	Great Britain.		France.		Marseilles.		Lyons.	Calcutta.	Straits.
	LBS.	RS.	LBS.	RS.	LBS.	RS.	RS.	RS.	RS.
1889	128	760	1,585	9,510	..	..	5,500	..	..
1890	4,688	15,772	4,706	28,245	..	..	..	..	..
1891	775	828	50	300	..	..	..	..	..
1892	80	640	200	1,400	..	..	..	..	..
1893	..	..	..	..	..	..	..	1,650	..
1894	..	..	..	..	..	..	128	1,500	..
1895	..	..	..	..	..	..	..	..	..
1896	..	..	..	..	31,275	20,187	..	192	..
1897	..	..	..	..	..	..	..	1,540	2,567
1898	..	..	..	..	..	..	..	1,250	..
Total ..	5,671	18,000	6,541	39,456	31,275	20,187	5,628	6,132	2,567

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4. EXPORTS—*Waste Silk.*

—	Great Britain.		Marseilles.		France.		Lyons.		Ceylon.	Bombay.	Suez.
	LBS.	RS.	LBS.	RS.	LBS.	RS.	LBS.	RS.	RS.	RS.	RS.
1889	211,723	1,99,527	..	..	1,475	1,180	7,603	7,860	45	..	..
1890	223,247	2,05,167	..	..	..	..	..	..	..	..	..
1891	167,760	1,54,271	..	..	4,968	4,352	..	..	..	500	..
1892	196,735	1,71,239	..	..	25,865	18,355	..	..	..	..	3,276
1893	202,599	1,73,717	..	..	26,722	18,218	600	525	..	..	..
1894	191,262	1,56,863	..	..	..	..	..	..	..	..	..
1895	270,578	2,32,140	18,428	14,492	26,238	16,087	..	..	..	..	..
1896	7,019	4,493	217,815	1,22,549	..	..	..	..	..	..	..
1897	10,060	4,625	256,580	1,29,044	..	..	..	..	..	..	..
1898	10,250	5,125	270,118	1,50,002	..	..	..	..	..	..	..
Total ..	14,912,33	13,07,167	762,941	4,16,087	85,268	58,192	8,203	8,385	45	500	3,276

5. EXPORTS—*Piece-Goods.*

—	Rangoon.	Ceylon.	Calcutta.	Bombay.	Straits.	Natal.	Mauritius.	Great Britain.	France.	Malta.	Suez.
	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.
1889	410	4,681	800	..	..	..	..	260	..	..	..
1890	..	240	1,800	..	576	..	140	..	..	..	..
1891	307	75	..	..	613	..	..	..	224	..	..
1892	..	..	..	3,126	..	..	..	100	100	..	..
1893	5,279	3,123	2,880	..	1,650	..	..	1,440	..	..	..
1894	2,310	3,432	1,070	..	1,480	279	..	..	..	..	..
1895	1,13,572	10,115	..	..	250	1,116	..	612	..	1,550	..
1896	73,650	8,162	2,500	..	90	872	..	15,220	..	1,000	..
1897	..	4,860	..	..	6,450	6,039	..	..	..	..	34,203
1898	18,055	1,825	..	..	..	2,240	..	..	..	..	1,200
Total ..	2,13,583	36,513	9,050	3,126	11,109	10,546	140	17,622	324	2,550	35,403

6. EXPORTS—*Cocoons, Cuttings and Tasar.*

—	Cocoons.								Cuttings.	Tasar.
	Great Britain.		Marseilles.		France.		Lyons.	Beyrout.	Great Britain.	Lyons.
	LBS.	RS.	LBS.	RS.	LBS.	RS.	RS.	RS.	RS.	RS.
1889	..	..	..	..	..	..	300	..	2,565	4,700
1890	2,816	3,872	..	..	..	..	..	..	..	..
1891	..	..	..	..	391	489	..	..	13,920	..
1892	1,405	2,205	..	..	2,859	3,350	..	..	..	..
1893	6,650	8,075	..	..	13,757	16,207	..	..	..	..
1894	1,860	1,611	..	..	613	686	..	1,012	..	..
1895	1,846	1,789	..	..	..	..	..	..	..	..
1896	1,921	2,083	3,790	2,559	..	..	..	..	..	..
1897	675	459	2,050	1,148	..	..	..	..	..	..
1898	..	..	7,667	4,957	..	..	..	..	..	..
Total ..	17,173	20,094	13,507	8,664	17,620	20,732	300	1,012	16,485	4,700

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To sum up, in few words, the more salient features of the trade, as brought out by the above tables, which speak for themselves. The supply of raw silk is obtained almost entirely from Calcutta. In other words, Bengal silk is largely used by the weavers. The bulk of the import trade in silk piece-goods is with Great Britain, which is followed, at long distances, by Calcutta and France. The British imports have, it is worthy of note, increased to a marked extent in recent years, the value thereof during the last half of the decade under review being Rs. 2,48,246 against Rs. 1,34,493 during the first half. The exports of raw silk are on a very limited scale, whereas waste silk is exported, principally to Great Britain and France, to a considerable amount. The diminished exports thereof to Great Britain, and increased exports to Marseilles, must, I conclude, be attributed to the dislocation of steam-boat traffic by plague quarantine regulations, the consignments reaching England by an indirect route.

The greatest exports of piece-goods are shown by the returns to be to Rangoon, the trade with which place, so far as silk fabrics are concerned, is fitful and oscillating, though it has increased appreciably during the last six years. The trade in silk piece-goods with Burma, Ceylon, the Straits, Natal, and Mauritius, is to be explained by the emigration which takes place from Southern India to these countries or localities, as shown in the following table; and the exported fabrics are adapted to the fashion and requirements of the emigrants, who, in their voluntary exile, welcome familiar wearing apparel of cotton, or cotton and silk mixed.

—	Regulated Emigration.		Non-regulated Emigration.	
	1897.	1898.	1897.	1898.
Mauritius	198	....	....	....
Natal	5,087	5,867	....	....
Straits	3,063	3,424	18,179	15,339
Burma	....	....	71,190	70,874
Ceylon	....	....	166,186	142,300

The trade names, by which the exported silk piece-goods are known in the market, are: comboyem, cuthney, dhootee, dhovetee, handkerchiefs, kylee, loongey (or lungi), narmady, sari, soosy, sylass, thavany, and women's cloths.

Ganjám district.—At Berhampur silk-weaving is carried on by males and females of the Dévángulu or Dévaravallu caste. The industry consists of weaving with both mulberry and tasar silk.

	Weavers.	Looms.
Mulberry	300	80
Tasar	30	8

There is a large demand for the woven fabrics locally, and a considerable export to places outside the district, principally Madras and Cuttack. All the manufactured cloths for males and females, Hindu and Muhammadan, find a ready sale, and the industry is said to be in a flourishing condition. Raw silk is obtained from Magara, and other places between Cuttack and Calcutta. In dyeing the silk, lac and kaméla, and "powders imported from Calcutta," are used. The favourite colours are purple and red. "The colour most used," Mr. Havell writes (Report on tour, 1886), "is the crimson produced from lac, and the cloths of Berhampur, unless specially ordered, are all of this colour." The fabrics consist of turbans, handkerchiefs, and body-cloths. Most of the weavers, especially in the case of the more valuable cloth, work for merchants on the piece-work system, being paid so much per cubit, and the cloths are sold by weight, at so much a tolah, according to quality. Children, about ten years old, are employed in the industry, and work the borders of the cloths with much intelligence. For Rajah's and wealthy native gentlemen, some gorgeous cloths are woven, with broad and elaborate borders of gold thread.

The following note on kaméla dye in Ganjám was published in the 'Indian Forester, 1892.'* "Among the many rich products of Ganjám, probably, the most esteemed in commerce is the red Kaméla dye, the valuable product of *Mallotus philippinensis* (monkey-face tree). This tree, with its lovely scarlet berries and vivid green emerald foliage, is a marked feature of forest scenery in Ganjám. The berries are coated with a beautiful red powder, which constitutes the dye. This powder is collected by being brushed off into baskets made for the purpose; but the method of collection is reckless and wasteful in the extreme, the trees being often felled to reach the berries more easily. The industry is a monopoly of the Hill Khonds, who, however, turn it to little advantage.

* *Vide* also 'Imperial Institute Hand-book—Kaméla.' Reprinted in the Appendix Series, 'Indian Forester, 1893.'

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They are ignorant of the great commercial value of the dye, and part with the powder to the low-country dealers settled among them for a few measures of rice or a yard or two of cloth. The industry is capable of great development, and a large fortune awaits the firm or individual with sufficient enterprise to enter into rivalry with the low-country native dealers settled among the Khonds, who at present enjoy a monopoly of the trade. It is notorious that these men are accumulating vast profits in respect of this dye, as they obtain the powder in barter from the Khonds for the most trifling equivalent, and send ship loads of it from the district. The local name for the dye is *sundragundi*. The tree is largely cultivated by the Khonds in their forest villages." It may be noted that, in recent years, dyers in Europe obtain the same colour with an artificial product, and with much greater facility, *i.e.*, without alum, and more rapidly.

In the Ganjám Maliahs the jungles are searched by Pános for tasar cocoons, and, just across the border, in Boad, the collection of these cocoons is a regular industry among the Pános. Small portions of jungle are specially reserved, and divided up into small sub-divisions. Each of these is given to a Páno for rent, and here he cultivates the silk-worms, and collects the silk. The silk is sent partly to Berhampúr, and partly to Sambulpúr, for manufacture.

Gódávari District.—The weaving community belongs, for the most part, to the Dévánga caste. The industry is carried on, by both males and females, in Tottaramudi, Jaganadhapuram, and Bodesakurru villages in the Amalápur taluk, and Peddápur in the Peddápur taluk. The number of weavers in the Amalápur taluk is 20, and at Peddápur 5. The industry is in a declining condition, as there is no great demand for silk fabrics, which are made to order. These fabrics consist of turbans, handkerchiefs, and body-cloths for Hindus and Muhammadans. The trade is mainly local, but sometimes extends to neighbouring places in the Northern Circars. The Peddápur weavers receive orders on a small scale from all parts of the Presidency. Wholesale dealers at Peddápur obtain silk from Bombay for retail sale to the weavers. No indigenous vegetable dyes are used. "Dyeing powders" are obtained from Bombay, and made into a solution with admixture of alum. The powders are used as they are cheap, as well as easy of manipulation. The weavers have no idea of prize-winning, and do not care to secure certificates of commendation at the Exhibition.

Mr. Havell, writing in 1890 (Journ. Ind. Art), says that "at Peddápur one weaver prepares cloths of a fine silk gauze, or muslin brocaded at the ends. They are worn by Zamindars or wealthy people as a kind of ceremonial costume, but are so fine that they are not suitable for ordinary wear.

Bellary District.—Both Hindus and Muhammadans are engaged in the weaving of silk cloths. Cloths of pure silk, *i.e.*, in which both warp and woof are of silk, are now rarely manufactured, the principal cloths being those with silk borders, or in which silk is used for the warp alone, the woof being of cotton. Sometimes silk is also used in the body of the cloths.

The principal castes engaged in the industry are Dévánga, Kuruvani, Padma Salai and Pathu Salai. The subsidiary processes, such as reeling and twisting the silk, are performed by the women of many other castes, *e.g.*, Kapus, Kurubas, barbers, and dancing girls.

The principal centres of the industry are—

	Looms.
(*a*) *Adóni taluk*—	
Adóni	2,462
Yemmiganúr	3,000
Gudikal	700
Kosigi	800
(*b*) *Hospet taluk*—	
Hospet	100
Chittavádigi	20
Kampli	200
(*c*) *Hadagalli taluk*—	
Hampaságara	400
Bachigondanahalli	170
Tambrahalli	200
Kottúr	405

The industry is declining. The women's cloths prepared locally are not now worn by the better classes, who prefer to buy cloths made at Tanjore, Kumbakónam, Madura, and other places in the Southern districts of the Presidency. Formerly the cloths of Kampli, Bellary, and Adóni were extensively used. For about a year the weavers have been trying to weave cloths like those manufactured in the south. So far the experiment has

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proved successful, and the cloths thus woven are finding a ready sale. If fast dyes are used, and the cloths do not lose colour with wear, the trade in them will become established, and the weaving industry may resume its former importance. Cloths of pure silk, with chequered pattern, gold brocade, or ornamental designs, and pitambar (Benares cloth) are only made to order for Hindus and Muhammadans on the occasion of weddings or other festive occasions. Cloths of mixed cotton and silk, such as female cloths, bodices, &c., are in more general use, and purchased by all classes in the Mysore Province, Belgaum, Dharwar and Bijapur.

Raw or dyed silk is obtained from Calcutta, Bombay, Sholápúr, Gokak, Belgaum, Bagalkot, Mysore, Bangalore, Chennapatna, and Kollegal.

Aniline and alizarine dyes are said to be seldom used, as they do not yield a fast colour.

Kistna District.—The silk industry is carried on by the Patakari caste at Jaggayyapéta, where there are 28 looms, each loom employing two males and three females. The industry is said to have declined since the construction of railways, which bring into competition the products of other places. The town is far away from the Nizam's Railway, which has affected the trade of the town generally. The fabrics turned out are male and female cloths, coats, bodices, and kamarbunds or sashes, which are purchased by all classes. The trade therein extends to the Gódávari and Vizagapatam districts, Hyderabad, Madras, and, less frequently, Calcutta. Raw silk is said to be at the present day obtained exclusively from Bangalore, as the supplies thereof from Bombay were found to be of indifferent quality. Both vegetable and mineral dyes are used. Among the former is kaméla obtained from the Gódávari and Vizagapatam districts. In the preparation of the red dyes the resinous exudation of the sál tree (*Shorea robusta*) is used.

Mr. Havell ('Report on Industrial Tour, 1886') refers to seven families of the Dasiri caste, who weave cloths of tasar silk obtained from Hyderabad at Jaggayyapéta.

Kurnool district.—The weavers are returned as belonging to the Khatri, Patlagadi and Atakara castes, and as Muhammadans.

	Weavers.	Looms.
Kodumúr	1,000	500
Peapali	100	50
Gudúr	380	192
Kurnool	10	5

The industry is declining, and, among the reasons for this decline, is the existing deterioration of the material condition of the classes among whom the fabrics are in demand, owing to a succession of bad seasons, these classes not being able to afford to "take silk." The opening out of railways has facilitated the import into the district of cheap cloths, of cotton and silk mixed, from Kornád, Poona, Bombay, and other places in the north. The result has been a falling off in the demand for cloths of local manufacture. Further, real silk is being gradually replaced by cheaper imitation silk. The fabrics manufactured at the weaving centres are female cloths, bodices, male cloths, and prayer cloths. Ordinarily, silk is only used for the borders of the warp; cloths of pure silk being only made to order. Prior to the recent famine there was a considerable export to Mysore, and the Southern districts of the Bombay Presidency. Since the famine this export trade has ceased, partly because the people are not as yet prosperous, and partly because of plague restrictions. Raw silk is obtained from Bangalore, Maddúr, and Chennapatna in Mysore; and to some extent from Madras and Bombay. Both indigenous and mineral dyes are used.

Anantapur district—(*a*) *Gooty taluk.*—The weavers belong to the Dévánga, Padma Sále, Pattu Sále, and Togata castes. Females are engaged in preparing the yarn, and males in weaving the fabrics. The industry is carried on at Uravakonda and Krishtapád. At the former place there are about 300, and at the latter 100 looms. Ordinarily female cloths, of cotton and silk mixed, are manufactured, pure silk cloths only being made to order. The industry has been declining in recent years owing to famine and plague. There is a demand for the fabrics both within, and beyond the limits of the district to Udipi, Hubli, Dharwar, and other places. Raw silk is obtained from Bangalore, Bellary, Mysore, and Hubli.

(*b*) *Tadpatri taluk.*—The weavers belong to the Pattakar or "Padasála" caste. Togatas and Muhammadans also weave cotton cloths with silk borders in the villages of Yádiki, Athiralladinna, Krishtapád, Narásapúr, and Yekkalúr—

	Looms.
Tadpatri	40
Athiralladinna	40
Yádiki	100
Krishtapád	75
Narsapúr	30
Yekkalúr	35

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The condition of the industry is not flourishing. Most of the weavers receive advances from merchants, weave the fabrics, and sell them to their creditors. But sales have been dull owing to famine and plague, and the merchants will not make advances. The fabrics made are generally coarse, and of the quality worn by the lower orders. They are sold in the local bazárs, and exported to Bangalore and Bellary. Vegetable dyes only are said to be used. Thirty years ago Tadpatri was famous for its pure silk cloths, but the industry therein has died out.

(*c*) *Dharmavaram taluk.*—The same castes as in the Gooty taluk are engaged in the silk industry at Dharmavaram, where there are 100 looms and 200 weavers. The industry is in a declining state owing to want of capital and encouragement. Raw silk was formerly brought by Muhammadans from Bangalore, and sold to the weavers on credit. But the Muhammadans have ceased coming, partly on account of the plague, and also because the weavers, in many instances, failed to pay them for the raw silk. The fabrics turned out are male and female cloths, jackets, turbans, and handkerchiefs, which are sent for sale to Gooty, Anantapúr, Hindupúr, Penukonda, and even as far as Bangalore. Raw silk is obtained from the Mysore province and Kollegal. Vegetable dyes only are said to be used.

In his report on an industrial tour in the districts of Bellary, Anantapur, etc., 1807, Mr. Havell writes that "Dharmavaram and Kampli in Bellary, are the chief places where fine cloths for female wear are made. The most effective and characteristic cloth is one with a white ground of a wide check pattern, crimson borders and brocaded ends, sometimes with figures of flowers, birds, etc. The best of this kind are made at Dharmavaram." And of the dyes he says further: "For silk the common dyes in use are: crimson, lac or cochineal; yellow, turmeric; various shades of orange, arnotto (seeds of *Bixa Orellana*) used alone or together with turmeric; black from iron; more rarely a rich green, indigo and turmeric; when ordered, a blue from indigo. Three very crude European dyes are also commonly used everywhere—a yellow, green, and purple. The contrast of these with the low-toned native crimson or orange is most painful."

(*d*) *Kalyandrúg taluk.*—The industry is carried on at Kalyandrúg by three families of the Kurivina caste, and is in its infancy. They weave coarse cotton cloths with yellow and red silk borders, which are made to order for female Komatis. The silk is obtained from Bellary and Hindupúr.

Nellore district.—Silk weaving is carried out, on a very small scale, at Venkatagiri. One man alone, in fact, who formerly lived at Conjeeveram, understands the process, and the last time he was engaged in this work was a few months ago, when he made a pair of handkerchiefs for a Muhammadan. The silk is obtained from Madras or Conjeeveram. There are a number of hereditary silk-weavers (Pattu Sáliyans) at Bangarupett, but they are at present employed in weaving cotton handkerchiefs and lungis for Muhammadans.

Madras City.—The silk industry is carried on by Patnúlkárans, Kaikola Mudalis, and Shaniyars in Mylapore, Puddunaickpet and Purasawákam—

	Weavers.	Looms.
Patnúlkárans	300	170
Kaikola Mudalis	300	400
Shaniyars	500	150

The industry is reported as being in a flourishing condition. The fabrics, which are of cotton and silk mixed, consist of body-cloths for Hindus and Muhammadans; and are sold locally, or sent to Rangoon, Natal, Ceylon, Calicut, and Colombo. The raw silk is obtained from Bangalore, Calcutta and Bombay. No vegetable dyes are made in Madras, the weavers preferring "English powders, which appear to be mineral."

Chingleput District.—The silk industry is confined to the town of Conjeeveram and its suburbs—

	Weavers.	Looms.
Conjeeveram	15,000	5,000
Ayyampet	1,000	200
Muthialpet	300	50
Ayyankulan	200	20

The weavers were returned as Kshatriyas, Saliyars, Nanayas, Kaikalavars, Kunthiliyans, and Seniars, with a few Vellálas, Chettis, Kavarais, and Pallis. Those, however, whom I interviewed, wearing the sacred thread, called themselves Patnúls. Men and boys, as well as women and girls, are engaged in the industry. The decline thereof in recent times is attributed to famine, plague, and the imports of cheap rival piece-goods, which look as good as silk when new. Moreover, the Seniars, who used to work under the Patnúls, now carry on weaving operations on their own account. At the present day only four or five looms are employed for the manufacture of plain coloured cloths for Muhammadans, whereas formerly 200 looms were at work for this purpose. The

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weavers are superstitious, and objected at first to being photographed, on the ground that the operation would bring death among them. They, like the weavers in nearly every district, were unwilling to advertise their wares, and send them to the Exhibition, on the ground that, owing to the depression in their trade, they are unable to prepare fabrics worthy to be exhibited.

Raw silk is obtained from Bangalore, Chennapatan in Mysore, Calcutta, and Bombay. The manufactured fabrics include red silk handkerchiefs, which are tied round the waist of the god at temple festivals; silk cloths worn by Bráhmans when they perform puja; women's cloths of pure silk, of white cotton with bands of gold and red silk, with chequered pattern, flowered border, etc. One cloth, with chequered pattern, is fancifully called High Court papli, as the squares of alternating colours resemble the flooring tiles in the corridors of the Madras High Court. The fabrics are sold locally, and exported to various important centres in the Madras Presidency. The weavers carry out orders for business houses in the city of Madras. One weaver volunteered the information that he makes bundles of cotton dyed with aniline dyes, which are suspended over the cradles of babies, to keep them cheerful and in good spirits by reason of their bright colours.

North Arcot district.—Silk weaving is carried on by the Sáliah, Patnúlkáran, and Kathisa castes. Both males and females are engaged in the industry, the latter preparing the sik for the loom.

The numbers of weavers and looms are as follows:—

	Weavers.	Looms.
Gudiyatam	1,500	400
Wálájanagar	500	300
Nemali	100	50
Ramapuram	50	30
Panapakam	30	20
Arni	?	346
Narayanavanam	1,280	320
Thumbur	200	50
Palamangalam	200	50
Mangudu	100	25
Gollapalli	120	30

The industry has been declining during the last two years owing chiefly to the competition of cheap power-loom foreign goods, to unfavourable seasons of scarcity, and to plague scare. The fabrics include cloths for wear by Hindus and Muhammadans. The trade is not confined within the district, as the cloths are sent to Madras, Mysore, and the Cuddapah, Anantapur, Bellary and Madura districts. The raw silk is obtained from Madras, Bangalore and other places in Mysore, Conjeeveram, and Bombay.

The raw silk is prepared by cleaning and steeping in an aqueous solution of country soda and lime-water, which brightens its colour.

The dyes used are—

Red—lac.
Yellow—Kapila-pindi (*Mallotus philippensis*—kamela).
Black—prepared from indigo.
Pink—red dye boiled with Fuller's earth.
Violet—red dye boiled with indigo.

The weavers do not, it is said, know what aniline and alizarine dyes are.

Writing in 1890 ('Journ. Ind. Art') Mr. Havell remarks that, at Wálájanagar, an old seat of the silk carpet industry, "there are now only two workmen employed in it. Probably the proximity of Vellore Jail, which must have once competed strongly with local manufacture, has been the chief cause of the commercial ruin of the Wálájahnagar carpet trade. The restrictions recently placed on jail manufactures, in this case, came too late."

The weaving operations are described as follows in the 'Manual of the North Arcot' (2nd edition, 1894): "The process of weaving is very simple. The thread is first turned off upon a hand-spindle (rátnam), and then the warp is formed. Bamboo sticks, 120 in number, are fixed upright in the ground, generally in the shade of a tope or grove, at a distance of a cubit from one another, and ten women or children, carrying rátnams in their hands, walk up and down this line, one behind the other, intertwining the thread between the bamboos, until 1,920 threads of various colours, according to the pattern desired, are thus arranged. For this work each gets half an anna—a small remuneration for walking four miles. To form a warp sufficient for eight women's cloths, 40 miles have thus to be traversed. In weaving silk cloths or the finer fabrics, the length of the warp is less than 60 yards. As soon as the threads have been arranged, the bamboos are plucked up, and rolled together

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with the threads upon them. Trestles are then set out in the tope, and upon them the warp with the bamboos is stretched horizontally, and sized by means of large long brushes soaked with rági starch, and carried along by two men. This having dried, the whole is rolled up, and placed in the loom in the weaver's house. The weaving-room is a long, narrow, dark chamber, lighted by one small window close to where the workman sits. The loom is constructed on the simplest principles, and can be taken to pieces in a few minutes, forming a light load for a man. The alternate threads of the warp are raised and depressed, to receive the woof in the following manner. Two pairs of bamboos are joined together by thin twine loops, and, being suspended from the roof, are also joined to two pedals near the floor. Through the joining loops of one pair of bamboos run half the threads, and through those of the other run the other half. Thus, by depressing one pedal with the foot and raising the other, one set of threads is depressed, and the other raised so as to admit of the woof thread being shot across. This thread is forced home by a light beam suspended from the roof, and then, the position of the pedals being reversed, the woof thread is shot back again between the reversed threads of the warp. In this way about three yards can be woven in a day."

[This account describes what may be seen going on in weaving centres throughout Southern India.]

The Patnúlkár weavers prepare the warp, and weave in the manner described, but they generally prepare a separate warp for each woman's cloth. The waste silk is sometimes cunningly worked up with the good, and is always used in twisting the waist threads (arainánkayir, molatédu) worn by men.

South Arcot district.—The weavers are returned as belonging to the Kannadia Saniar (speaking Kanarese), Dévanga, Sheda, Patnúlkáran and Thánánkula castes. No pure silk weaving is carried on in any taluk except Chidambaram; but fabrics of silk and cotton mixed are manufactured in the Kallakurchi, Tindivánam, Cuddalore and Villupuram taluks.

(*a*) *Kallakurchi taluk.*—Weaving is carried out at only two villages, viz., Kongaraiyapálaiyam (three or four houses), and Odaiyanachi (one house). The weavers generally manufacture pure cotton cloths, and only turn out fabrics with admixture of silk to order. The silk is obtained, ready dyed, from Kumbakónam and Conjeeveram.

(*b*) *Chidambaram taluk.*—The industry is carried on at a series of villages comprising the following centres:—

	Weavers.	Looms.
Bhuvanagiri	4,000 to 5,000	1,000
Chidambaram	3,000	600
Mannárgudi	2,000	400

The industry is declining owing to the cheapness of imported foreign cloths. But there is still a considerable demand for the kailies of Bhuvanagiri, which are exported to Singapore, and the trade therein is still in a fairly flourishing condition. The cloths manufactured at Chidambaram are sent to Mysore, Chingleput, North Arcot, etc. The cloths of Mannárgudi are sold locally. Raw silk is obtained from Calcutta, Bangalore, and Kumbakónam. The use of mineral dyes is now established.

(*c*) *Cuddalore taluk.*—Fabrics of silk and cotton mixed are turned out in the villages of Panruti and Vadakailásam, where kailies, for local sale and export to the Straits Settlements, and cloths worn by Hindus, "especially by religious classes," are manufactured. Raw silk is obtained from Madras, Kumbakónam, and Conjeeveram.

(*d*) *Villupuram taluk.*—A small, and declining industry in fabrics of silk and cotton mixed is carried on in the villages of Siruvandádu and Moktchakulam.

(*e*) *Tindivanam taluk.*—A declining industry in cloths of silk and cotton mixed is carried on at the village of Avalúr, where there are only five looms. The trade is local, and silk is obtained, ready dyed, from Conjeeveram.

Trichinopoly district.—The silk weavers belong to the Patnúlkáran caste. Females are usually employed in the preliminary stages, dressing, twisting, reeling, etc. The industry is carried on at Trichinopoly, Turaiyúr, Manamédu, Mavilipatti, Aiyampalayam, Kottatúr, Ariyalúr, Jeyamkondasholapuram, Udayanattam, Karuppúr, Thatampettai, Palúr, Sondurai, Anandavadi, Vanatirayanpatnam and Manjamédu. At Trichinopoly there are 2,500 weavers and 1,500 looms.

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The industry is gradually declining. The artisans attribute this to the competition of cheaper machine-woven goods from Europe, and of the "less genuine and cheaper fabrics dyed in gaudy and fugitive colours with chemical dyes."

In the town of Trichinopoly fabrics suitable for Muhammadan males and females are chiefly manufactured. Fabrics for Hindus are also made, but to a limited extent. Ariyalúr is famous for the manufacture of female bodices, known as thatturavikki, worn by all classes. The Trichinopoly town fabrics are sent to Bombay, Hyderabad, Bangalore, Madras, Tirupattúr and Vaniambádi in the Salem district, Amúr and Vellore in the North Arcot district, Madura, and Tinnevelly. The towels and handkerchiefs manufactured at Ariyalúr are purchased locally within the district, while the bodice trade extends to the Tanjore and Madura districts. The raw silk is obtained from Calcutta and Mysore.

Red and yellow dyes are prepared locally, while black, green, purple, etc., are obtained from the Tanjore district. Aniline and alizarine dyes are sometimes used instead of vegetable dyes, as they are cheaper and require less time and labour, while producing more gaudy colours than the vegetable dyes. These "chemical dyes," it is reported, "are employed only for fabrics not intended to last long, wear long, or be exposed to sun and water. The colours obtained from these mineral dyes are very fugitive, and the fabrics do not retain the colour permanently, but impart the colouring matter to any substance that may come in contact with them. The indigenous vegetable dye-stuffs are, therefore, naturally preferred, as they produce faster colours, and more refined and artistic tones than the chemical dyes." [The truth of the last remark can be readily verified by inspection of the beautiful cotton, silk and satin fabrics from Adoni, Kampli, Arni, Walajanagar, Conjeeveram, Ayyampét, and Madura, in the industrial section of the Madras Museum.]

Writing concerning the satin industry of the Madras Presidency, Mr. Havell says ('Journ. Ind. Art,' 1890): "Satin is manufactured at Ayyampet (Tanjore), Arcot and Wálájahnagar (North Arcot), and Ariyalúr (Trichinopoly). It is a beautiful industry, which has hitherto attracted little notice. The material produced at the three first places is worn by Muhammadans for trousers, the principal trade being with Hyderabad. The arrangement of colour is very bold and brilliant, but always in good taste. The Ariyalúr satin is distinct in style, and of remarkable beauty in colour, as well as tasteful in the simple patterns woven generally in stripes across it. The *ravikkai* (Hindi, *choli*) worn by native ladies is made of it. Only two men are engaged in this industry, which, as far as I know, has never been noticed before. A kind similar in style, but inferior in colour and execution, is produced in the town of Trichinopoly, embroidered with patterns in silver lace."

Tanjore district.—Those engaged in the silk industry are returned as Patnúlkáran, Kaikolán, Sedan, Sáliyah, Seniyah, Sauráshtra, Kavarai, Vellála, Vaduga, Agambadian, and Muhammadan. The industry, in which both males and females are employed, is said to be declining owing to the rise in price of silk, the imports of European piece-goods, and decreasing demand for fabrics for Ceylon, Penang, Singapore, etc. In some places indigenous dyes, in others both indigenous and mineral dyes are used.

(*a*) *Tanjore range.*—Fabrics are made at Ayyampét, Manambuchávady, and Kandyur (to a very limited extent)—

	Weavers.	Looms.
Ayyampét	900	600
Manambuchávady	900	600

The fabrics manufactured consist of weaving apparel for Hindus and Muhammadans, of silk or silk and cotton mixed; silk carpets; and material for making pillows and cushions. The Tanjore district was formerly well known for the manufacture of silk carpets of great beauty, but the industry has almost entirely disappeared. A silk carpet, which was made to order at Ayyampét three years ago for the Madras Museum, possesses no special merit, either as regards design or colour. The weavers now-a-days complain that fabrics, made in mimicry of their own, but with a more delicate texture and cheaper, in Europe, as well as fabrics imported from Poona and Bombay, have interfered with their business. Their own fabrics are sold throughout the Madras Presidency, and also find a market in Bombay, Kampti, Nagpúr, Jubbulpúr, Saugor, Hoshungábad and other places in Northern India; and in Penang, Singapore and Rangoon. The raw silk is obtained from Malda; Calcutta; Maddur, Chennapatnam, and Closepet in Mysore; and Kollegál.

(*b*) *Mannárgudi.*—The industry is carried on in the town of Mannárgudi, where there are about 35 weavers and 30 looms. No pure silk fabrics are now made, but only Hindu clothing of silk and cotton mixed. The trade is local within the district. Raw silk is obtained from Patnúl merchants at Kumbakónam.

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(*c*) *Negapatam division*—

	Weavers.	Looms.
Ammaiyappan, Elangudi, Thonkal	1,000	300
Sangamangalam	86	83
Manjakollai, Puthúr	5	5
Poravachcri	200	140
Semangalam	16	8
Madapuram	2	2
Vijayapuram	14	14
Alivalamand	37	37
Tappalámpuliyúr	10	10

Raw silk is obtained from Calcutta, Bombay, Mysore, Kumbakónam and Europe. Cotton cloths, interwoven with silk, are sold to Hindus; and 'kailies' are purchased by Muhammadans, and exported to Colombo, Rangoon, Singapore, and Penang.

(*d*) *Kumbakónam taluk*—

	Weavers.	Looms.
Kumbakónam	2,500	2,000
Swamimalai	300	300
Tiruluvanam	600	100
Govindapuram	200	100
Adutorai	200	100
Narasingampet	200	100
Elumichangapolayam	75	50
Pattisvaram	200	150
Davasaram	400	200
Sholamaligai	100	50
Kodivamangalam	150	100
Thuyili	150	100
Kanjanúr	75	50
Kottúr	175	150
Tirunayeswaram	150	100
Kepperumanallúr	200	200
Aiyavadi	100	50
Ammachuttram	100	100
Valangiman	200	100
Sundraperumalkovil	75	50
Papanásam	50	25
Tirucchirai	100	50

The cloths manufactured are mainly female cloth, bodices, petticoats, etc., of pure silk or silk and cotton mixed. The raw silk is said to be obtained from Madras, Madura, Calcutta, Bombay, China, Italy, and other places.

(*e*) *Máyavaram taluk*—

	Weavers.	Looms.
Máyavaram	2,800	1,040
Kuttálam	800	343
M. Manamédu	105	35
Athúr	40	20
Keelayúr	28	14
Sembanarkovil	150	65
Kidarankondan	20	2
Talachangadu	9	3
Erukattanseri	50	16
Porayar	18	9

Silk dyeing is carried on at Máyavaram and Kuttálam. But silk cloths, mixed with cotton, are made at all the above places, and purchased by Hindus, Muhammadans, and Christians. Raw silk is obtained from Kumbakónam.

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Madura district.—The weavers belong to the Sauráshtra caste, concerning which Mr. H. A. Stuart, Census Commissioner, 1881, writes as follows: "The Patnúlkárans or Pattu-núl-kárans (lit-silk-thread men) are a caste of silk weavers. They are found chiefly in the districts of Madura, Salem, Trichinopoly, and Tinnevelly. They are immigrants from Guzarat, and speak a dialect of Guzaráti. It is said that their forefathers were induced to settle in Madura by Tirumala Naik in the seventeenth century. They have returned 54 sub-divisions, but many of these are not real sub-divisions at all. For example, 7,487 have returned Bráhmana, 4,341 Chetti, 17,290 Sauráshtra. They claim to be Bráhmans, and in Madura, where this pretention is asserted with obstinate vehemence, they style themselves '*Iyer*.' They wear the sacred thread."

(*a*) *Madura town.*—Females are employed in the "throwing operations," males in dyeing and weaving. Pure silk fabrics, and fabrics of cotton and silk mixed, are made in the shape of turbans and body-cloths. The number of looms is said to be about 2,000, and of weavers 1,500. The industry is not flourishing owing to the extensive imports of machine-made goods from England, and of gold lace in large quantities from France. [The imports of gold lace into the port of Madras, in 1898, were valued at Rs. 11,30,398.]

Raw silk is obtained from Calcutta, Bombay, Kollegál, Bangalore, and Mathúr in the Mysore province. In dyeing, kaméla and lac are used for the production of yellow and red dyes. Aniline dyes are said to be rarely resorted to, as, though they give lustre and brilliancy, they are not so permanent as the indigenous dyes.

(*b*) *Dindigul.*—In the town of Dindigul there are about 300 looms and 600 weavers; but on only one loom are pure silk fabrics (*i.e.*, without admixture of cotton) woven. The industry is declining owing to the imports of fabrics from Bangalore and other places. Dyed silk thread is obtained from Madura.

(*c*) *Paramakudi division.*—The industry is carried on at Paramakudi and Emunéswaram.

	Weavers.	Looms.
Paramakudi	1,500	500
Emunéswaram	600	200

The fabrics manufactured consist of red and white silk cloths, cloths of silk and cotton, or silk and 'lace' combined, and pure silk handkerchiefs. They are sold locally, and exported to various places in Southern India, and Ceylon, Rangoon, Penang, and Delhí. Raw silk is obtained from Calcutta, Kollegál, and Kumbakónam. Mineral dyes are used. The industry is declining owing to the imports of cheap foreign piece-goods. Some of the weavers have left their native place, to earn a living by other manual labour, as the demand for their woven goods has fallen off.

(*d*) *Ramnád taluk.*—Cloths of cotton and silk mixed are manufactured at Ramnád, where there are about 20 looms. Dye-powders (called *kabíl*) from Europe are now used in lieu of the more expensive indigenous dyes. The industry is in a languishing condition owing to paucity of demand, and the trade in the fabrics turned out is local within the district.

In an address presented to the Governor of Madras, in 1897, the Sauráshtra community stated that "the masses who eke out their livelihood by weaving and dyeing have not a scientific knowledge of the industries which they practise. We, therefore, deem it necessary to suggest that the establishment of textile schools and technical dye-houses for imparting instruction in the said industries will be an effective mode of encouraging them, and the means of ameliorating the condition of the industrial classes." In connection with this practical suggestion on the part of artisans, who see their hereditary craft failing them as a lucrative source of income, I may quote the opinion expressed by the Committee, appointed by Government to enquire into the re-organisation of the Madras School of Arts and Industries (1895). "The Committee," the report states, "believe from the evidence (of weavers and dyers) before them that there is a distinct field for the establishment, in connection with the School of Arts and Industries, of a school of dyeing, printing, and weaving, according to the most advanced knowledge of the time, and adapted for both employers and operatives. They believe further that the establishment of such a school might, by attracting the attention of capitalists, help to check the importation of cheap and vulgar European manufactures with debased Indian design. There appears to be every reason to believe that the classes would be largely attended from the commencement both by native dyers and their sons, and by Europeans; and it is within the knowledge of the Committee that one firm would send at least ten Europeans to receive instruction at the school. It would be necessary that the school should be completely equipped with dye-houses, chemical laboratory, &c., and that the staff should include a European dyeing expert to teach the theory and practice of dyeing . . . . During the five years 1890 to 1895, 3,192,304 lbs. of aniline and alizarine dyes were imported into the Madras Presidency. These dyes are, in fact, so firmly established in the Indian market that no measure short of a prohibitive import duty can arrest their employment. It seems to the Committee that, even allowing that these dyes are to be utterly condemned from an asthetic point of view, distinct practical good would result from educating the hitherto self-taught native dyers in the proper way of selecting and manipulating them,

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neither of which points they at present, from want of special training, understand. Quite apart, however, from the teaching of improved methods of dyeing with artificial dyes, one object of the school should be to try and improve that present laborious process of manufacture of the indigenous vegetable dyes, for it is universally admitted by the native dyers that they only use the artificial dyes because they are cheap and quick in operation.

Quite recently the Saurâshtra community submitted a memorial to His Excellency the Governor, to the effect that "as the backward Saurâshtra community have not the requisite capital of half a lakh of rupees for imparting to their members both general and technical education, the Saurâshtra Sabha, Madura, suggests that a lottery office may be kept for collecting shares at one rupee each from such of the public at large as may be willing to give the same on the understanding that, every time the collections aggregate to Rs. 6,250, Rs. 250 should be set apart for the expenses of working the said office, and two-thirds of the remainder for educational purposes as aforesaid, and one-third should be awarded by drawing lots among the subscribers in the shape of five prizes—the first being for Rs. 1,000, the second for Rs. 500, the third for Rs. 250, and the fourth and the fifth for Rs. 125 each." In passing orders on this sporting scheme, the Government stated that it is not prepared to authorise the lottery.

The Madras School of Arts and Industries has, during the last year or two, done much to promote an exotic (the aluminium) industry; and the question arises whether it might not, in like manner, attempt to re-vivify an indigenous industry, which is softly and silently fading away.

Salem district.—The various castes, to which the weaving community belongs, are as follows:—

(*a*) Jedar—Salem, Dharmapuri and Trichengodu taluks.
(*b*) Patnûl—Salem and Âtur taluks.
(*c*) Kaikalan—Salem, Trichengodu and Âtur taluks.
(*d*) Saliyan—Dharmapuri and Âtur taluks.
(*e*) Pathar (Sembedar)—Trichengodu taluk.
(*f*) Padmasalai Chettis (Hindus)—Hosur taluk.
(*g*) Muhammadans and Native Christians—to a slight extent in Salem taluk.

Females, and children above eight years of age, are employed in cleaning and spinning the silk, and preparing the twist. Weaving on the looms is carried out only by men.

In the Salem taluk the silk industry is carried on only in the Salem and Shevapet divisions of Salem town; in the Hosûr taluk only at Berikai. In the Âtur taluk weaving of cotton cloths with silk borders is carried on in nine villages, of which Âtur, Ariyalûr, E. Rajapoliem, and Veppampoondy are the chief centres. In these villages there are 2,324 weavers and 389 hand-looms. In fifty-six other villages in this taluk, there are 975 weavers and 130 looms. In Dharmapuri taluk the industry is carried on at Dharmapuri, Adamankotta, Kadagathûr, and Ramana Chinnamahalli.

In the Trichengodu taluk weaving is carried on in seventeen villages.

In Salem and Shevapet there are about 10 looms, and 30 weavers, who make pure silk cloths only to order. In Hosûr taluk there are 460 looms, of which 22 are set apart for "superior cloths." In Dharmapuri taluk there are 145 weavers, employed at 84 looms; and in Trichengodu taluk 250 weavers at 200 looms. The Salem Tahsildar has not given the number of looms, and weavers employed in the manufacture of other than pure silk cloths. In 1872 there were 2,600 families of weavers, and 7,000 looms.

At Salem the demand for pure silk cloths is not great, such cloths being only made to order for the richer classes. The demand for white cotton cloths with silk borders is good; and such cloths are manufactured on a wide scale, sold locally, and exported. In the Hosûr taluk the silk industry had, until the recent outbreak of plague, remained stationary for some years. The weavers, however, frequently complain that the use of machine-made cloth is prejudicial to their trade. In Berikai the village munsif owns a loom fitted for the manufacture of silk cloths of superior fineness and design worth Rs. 200 to Rs. 700. He has not sold any of these cloths for the last five years, but formerly supplied them to the Mysore palace and the Poligars of Berikai, Shulagiri, and Bangalore. In the Dharmapuri taluk the industry is very much on the decline, the demand being diminished owing to the importation of English goods. The same decline appears in the Trichengodu and Âtur taluks, and is attributed to the same cause—competition of English machine-made goods, which has lowered the price of country-made cloths.

At Salem the chief fabrics turned out by the weavers are (1) cloths (pattumadi) of three or four colours worn by males and females; (2) silk female cloths, generally worn by Muhammadan women. In the Hosûr taluk cloths of inferior quality are mainly woven for sale locally to Hindus. Turbans and cloths of special design, woven at Berikai, are supplied to distant places. In the Dharmapuri taluk cotton cloths with silk borders are made for Hindus. In the Âtur and Trichengodu taluks, coarse male and female cloths, with silk front and borders, are made for the lower classes of Hindus.

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At Salem silk fabrics are not generally sold in the bazárs, but made to order on advances paid beforehand. In four looms, which Mr. R. A. Jenkins, Assistant Collector, personally inspected during the preparation of this report, rich silk cloths were being woven for some wealthy natives at Calicut, who had given orders for the work, and advanced money in part-payment. In the Hosúr taluk the silk-bordered cloths generally manufactured are sold locally within a radius of ten miles from Berikai.

Special orders have, however, been received from Mysore for pure silk cloths of superior design. In the other three taluks the trade, such as it is, is purely local.

At Salem raw silk is obtained by capitalists from Mathúr, Madras, Bangalore, and Kollégal. In Hosúr it is purchased at Berikai only, being brought there from Bangalore. In Dharmapuri the raw silk is obtained from Salem and Conjeeveram; and in Átur and Trichengodu from Salem.

As regards the preparation of the raw silk for the loom, the Tahsildar of Salem reports as follows: The silk is cleaned, washed, and soaked in a caustic solution made from the ashes of nayuruvi (*Achyranthes aspera*) and pachan-pazhuppu (turmeric), which removes the gum, and adds gloss to the silk. After this, a red powder, called kapili (*Mallotus philippensis*—kaméla) is treated with oil, and dissolved in water, to which some alum has been added. In this solution the silk is allowed to soak for a day or two according to its strength.

The weavers are unacquainted with mineral dyes, and either dye the silk with indigenous vegetable dyes, or purchase it ready-dyed from Conjeeveram and Salem. They were not willing to send samples of their work to the Exhibition.

In a note on the subject of the weavers during the famine-year 1892, by Mr. G. Kothandaramayya Garu, Special Deputy Collector, the weavers are divided into three sections:—

(1) Cooly weavers, who, owning no looms or suitable houses, work at the looms of the richer weavers, depending on daily wages.

(2) Poorer weaving families, who, being natives of, or domiciled in Salem, work at their own looms and in their own houses, on orders and advances from merchants and others, but possessing little capital of their own, and depending more or less upon the prospect of a ready sale for their goods.

(3) Richer weavers, who own a considerable number of looms, and work them on a large scale, by means of hired coolies, to meet their extensive demands.

Coimbatore district.—The silk-weavers belong to the Dévánga caste. Weaving is carried on, on a large scale, only in the Kollegál taluk, where there are about 1,000 looms and the same number of weavers. The industry is said to have suffered of late owing to the plague in Bombay and Mysore. Cloths for males and females, and turbans are made. The fabrics are sold locally, and sent to Madras, Mysore, Bangalore, and other places. Both vegetable and mineral dyes are used in dyeing the silk, which is obtained from various villages in the Kollegál taluk, and from Mysore.

Yellow dye—turmeric.
Orange dye—Kaméla (*Mallotus philippensis*) and arnatto (*Bixa Orellana*).
Crimson dye—cochineal.
Black dye—indigo.

In the revised edition of the 'Manual of the Coimbatore district' (1898), it is stated that "silk culture and weaving are only carried on in Kollegál, where the climate is favourable both for the "worm" (Bombyx mori) and the mulberry. The dyes are very good, and the finished cloths very effective and handsome. The value of a silk cloth ranges from Rs. 30 to Rs. 500 according to quality, finish, and ornamentation. In some cases the cloths are ornamented by the introduction of silver and other embroidery woven into the cloth while still in the loom. Such cloths are particularly effective, but somewhat costly."

The following interesting account of the silk-culture (sericulture) in Kollegál is given in a report on the arts and industries of the Coimbatore district submitted to Government in 1888 by Mr. Havell:—

"*Mode of cultivating the mulberry plants.*—In the rainy season, immediately after the fall of rain, fields containing black soil or clay are ploughed four or five times into furrows, and the soil loosened. On another fall of rain, mulberry cuttings, each one foot length, are planted in small pits a yard apart in the same manner as sugarcanes are planted. Within two days these cuttings begin to take root and to sprout. At this time the plantation is weeded and the soil around the plants broken up and fresh earth mixed therewith. At the end of four months the plants grow to perfection.

"*Rearing of silk-worms.*—One seer of cocoons is usually bought for one rupee. They are laid in large bamboo trays (resembling sieves) which are suspended by ropes for eight days out of the reach of rats and ants. On the ninth day the moths begin to come out of the cocoons. They are at once removed to another bamboo tray, in which they are kept for one day. Next day the male moths are taken out and thrown away. Before the evening of that day female moths lay their eggs and the next day they are also removed from the trays and thrown away. The trays are then hung about the roof, and covered with thin cloth to protect the eggs from flies, ants and lizards. On the seventh day after the eggs are laid, the silk-worms begin to come out. At this stage the worms are fed with small cuttings of tender leaves of mulberry plants five times in the day and five times in the night. Thus they

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are fed for seven days. On the eighth day they discontinue feeding, and lie down without moving. In this state they are said to be attacked with fever. On the morning of the next day they recover, and are fed as before with small cuttings of mulberry leaves. In this way they are fed for four days. Then they are attacked with fever a second time, and discontinue feeding. Next day they are again fed as usual. After the lapse of four more days they are attacked with fever a third time. Next day they recover as usual, and are fed with full-grown mulberry leaves for four days longer, when they are attacked a fourth time. At the time of the first fever the worms in one tray are transferred to two trays. On the second attack the worms in two trays are removed to eight trays; for the third fever they are removed to sixteen trays, and for the fourth to thirty-two trays. In four days after the fourth attack the worms grow large, and change colour from white to purple. At this stage they discontinue feeding altogether, and are removed to bamboo tatties called chendrigai. Three days afterwards they begin to spin cocoons. During the process the tatties are exposed to the morning sun at sunrise for about half an hour, and then hung up to the roof inside the house. In two days more the cocoons are collected in bamboo baskets; a sufficient number are laid aside for a fresh propagation, and the rest are subjected to a steaming process to kill the chrysalides. The silk is unwound from the cocoons by putting them in a chatty with boiling water and a few cleaning nuts (ponnálangái), and attaching the ends of two or more cocoons to a light wheel turned by hand. The cleaning nuts probably serve as a solvent for the natural gum secreted by the silk-worm for building the walls of his cocoon together. There does not appear to be any specific disease prevalent in the taluk among the silk-worms. They are said to be affected in abnormal seasons of heat or rain, but not to such an extent as to produce a marked loss in the quantity of silk."

Tasar silk (Antheræa mylitta). Though the experiments ended in failure, this monograph would be incomplete, were a reference to attempts, made in recent years, to rear tasar silk-worms omitted.

In 1886, as the result of an exhibit of tasar cocoons at the Indo-Colonial Exhibition in the previous year, a supply of cocoons, from the Vizagapatam and Chingleput districts, was forwarded to the expert Mr. Cleghorn, who pronounced them to be very good, especially those from the Kambákam jungles of Chingleput. He reported that the silk reeled from these cocoons was superior to any tasar that he had seen in Bengal, and added that Messrs. R. Watson & Co. would be glad to purchase all that district could supply at Rs. 7 or 8 a kahon (=1,280 cocoons), and that they would, even if a minimum supply of 15,000 kahons could be ensured, be prepared to build a factory on the spot, if the requisite labour could be secured. The Collector of Chingleput, who was consulted, reported that he doubted the possibility of his being able to supply cocoons in sufficient quantities to be of practical utility, as the headmen of the jungle tribes assured him that they could not collect more than 2,000 cocoons a year. The Conservator of Forests thought it impossible to guarantee anything like a minimum supply of two million cocoons, though that number might probably be worked up in two or three years, if the matter received the attention it deserved. Samples of cocoons as examined by Mr. Cleghorn, and of the larger kind met with in villages along the coast, were furnished to the Mylitta Silk Mills Company, then doing business in Madras, who offered to take the cocoons, if offered in lots of 250 or 300 kahons, at Rs. 4 per kahon for the inland cocoons and Rs. 5 for the coast ones. Government then decided to appoint a special officer (on Rs. 80 per mensem) to collect reliable information, and make arrangements with the hillmen or jungle tribes for breeding the "worms," and collecting the cocoons.

Details of the scheme adopted for establishing a tasar silk industry in the Presidency will be found, by any one who may be tempted to embark in this industry hereafter, in Proceedings of the Board of Revenue (Revenue Settlement, Land Records and Agriculture), No. 92, dated 1st March 1889, and No. 388, dated 4th September 1891; and in G.O., Revenue, No. 948, dated 25th November 1889. Suffice it here to state that the main cause of failure of the experiment was due to disappearance of the "worms" at one of the experimental stations owing to carelessness on the part of those charged with the custody and care thereof. The result of the experiment is said to have been, in 1891, "an expenditure of Rs. 1,505-9-5 without any corresponding revenue. The cocoons spun are said to be quite unfit for breeding purposes." More recently, in 1893, in connection with a scheme proposed by Mr. Tytler, the Board of Revenue observed that "silk-worm rearing has already been attempted in this Presidency on behalf of Government, and proved an expensive failure. The matter is one which, the Board thinks, must be left to private enterprise."

It remains, in conclusion, to thank collectively the various district officers, who found time, amid the pressure of other duties, to furnish me with the information, of which I have freely availed myself in the district notes.

GOVERNMENT MUSEUM, MADRAS,
October 18, 1899.

EDGAR THURSTON.

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The Ivory Carving Industry of Southern India.

IVORY, as used in the industrial arts in India, is obtained from the elongated conical incisor teeth or tusks of Elephas maximus, the Indian or Asiatic elephant. These tusks are composed mainly of solid dentine, the fine elastic quality and large mass of which renders it invaluable as ivory for commerce and the arts. "Tusks are firmly embedded in sockets or cylinders of bone, which run up to the forehead, and end at a line drawn from eye to eye. Tusks, except those of very aged elephants, are only solid for a portion of their length; the hollow is filled with a firm, bloody pulp. In young animals the tusks are only solid for a portion of their length even outside the gum, and are hollow throughout the embedded portion. With age the pulp cavity decreases in depth, till, in very old animals, it becomes almost obliterated."[1]

The African elephant possesses the largest tusks, these attaining to a length of 9 or 10 feet, and a weight of 160 lb. each, whilst the tusk of an Indian elephant, which measured 8 feet in length, and weighed 90 lb., has been placed on record as exceptionally large. A pair of African tusks at the London Exhibition of 1851 weighed 325 lb. and measured 8 feet 6 inches in length, and 22 inches in circumference. But authorities, acquainted with the African ivory districts, give 20 to 50 lb. as the average weight of tusks. In Africa both males and females are furnished with large tusks; but, in the Indian species, a sexual difference exists, the tusks of the female only projecting a few inches from the gums, while, even of the males, by no means all are 'tuskers.' Sanderson says that 10 per cent. of Indian male elephants have very small tusks, while, in Ceylon, only one in three hundred of the males is powerfully armed.

With regard to the tusks of elephants, Mr. W. Maskell writes[2]:—"African and Asiatic ivory must be distinguished. The first, when recently cut, is of a mellow, warm, transparent tint, with scarcely any appearance of grain, in which state it is called transparent or green ivory; but, as the oil dries up by exposure to the air, it becomes lighter in colour. Asiatic ivory, when newly cut, appears more like the African which has been long exposed to the air, and tends to become yellow by exposure. The African variety has usually a closer texture, works harder, and takes a better polish than the Asiatic."

The main seats of the ivory industry in Southern India are, at the present day, the Native States of Travancore and Mysore, and the British districts of Vizagapatam and Gódávari. With these centres I will deal *seriatim*.

To my friend Mr. Harold S. Ferguson, Director of the Travancore Government Museum, my hearty thanks are due for the following memorandum on ivory carving in Travancore, which he has been good enough to prepare in connection with the present monograph:—

IVORY CARVING IN TRAVANCORE.

The art of carving in ivory has long been known in India. The Silpa or Sthapatya Veda, the fourth of the Upa Vedas, which treats of the mechanical arts and architecture, gives ivory as one of the several kinds of materials[3] fitted for making idols. Figures and conventional designs carved in ivory as mentioned in the Ramayana as being used for the decoration of houses, furniture, and the chariots of warriors.

When ivory carving was first introduced into Travancore is uncertain. Goldsmiths from time immemorial had practised turning plain articles in ivory and horn; and, being accustomed to casting figures of the Hindu pantheon according to the proportions laid down in the Silpa Sastra, they turned their knowledge to account in making small ivory figures, especially of Ganesa and Hanuman, according to these proportions. The chief use, however, to which ivory was put in early days, was the decoration of palanquins. For this purpose thin plates

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[1] Sanderson. Thirteen years among the wild beasts of India.

[2] Ivories, ancient and mediæval. 'South Kensington Hand-book.'

[3] In the Sukranceti, Dr. Oppert mentions sand, flour, drawings, mortar, mud, wood, stone and metals as being suitable for the manufacture of idols. From another source I gather that there are eight ways of making an idol, viz., saiti (stone), dárumayi (wood), lauhi (metal), lipya (lime), álekhyá (pictures), saikatí (sand), manómayí (mental), manimayí (precious stones).

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of ivory, about an eighth of an inch in thickness, were laid over the wooden frames of the palanquins. The plates were engraved throughout with conventional designs, taken mostly from the Pagodas, and coloured with fast dyes. The plate to be engraved was coated with wax, in which the design was cut. Lime juice was poured over it, and allowed to bite into the surface of the ivory. Various colours were then run in, which fixed the design.[1]

It may be of interest here to insert a description of the conventional designs generally used, which has been prepared by Mr. Narayana Iyer, Superintendent of the School of Arts, to whom I am indebted for much of the information contained in this memorandum.

1. *The human form*—

(*a*) Bhoothams, very short and stout. The full figure is generally introduced.

(*b*) Maharshi's head. The head of a Sanyasi with long beard and twisted tuft. The head alone is introduced in the design.

(*c*) Kimpiri. Face alone, having crooked teeth, monkey's features, pig's ears, snake's eyes, and ram's horns.

2. *Animals*—

(*a*) Vyali. Generally in the form of a horse with tusks and trunk.

(*b*) Simhom, or lion conventionalised. The face is similar to that of the Vyali, without the tusks and trunk.

(*c*) Vyagrom or tiger. Slightly different from the lion pattern.

(*d*) Elephants, deer, monkeys, squirrels, pigs, sheep, etc., also conventionalised, are shown fully, or the faces alone are represented.

3. *Birds*—

(*a*) Vyali bird. The face resembles that of the animal of the same name, without the trunk and tusks.

(*b*) Annom, or swan-like bird. These are the favourite birds.

(*c*) Peacocks, parrots, and fowls are also rarely introduced in conventionalised forms.

4. *Fish*—

(*a*) Makara. The face of this is invariably introduced for ornaments of gods, especially the ear-ornaments. Brahmins, who perform sacrifices or yogas, wear ear-ornaments of gold with this design, called Makara-kundala, even at the present day.

(*b*) Serpents conventionalised are often introduced, with one or three heads.

(*c*) The head of a fish and body of a snake are generally combined.

5. Fruits, leaves, flowers, creepers, and trees are conventionalised without any special rule.

It is noteworthy that the images of gods seldom form part of a design. They are kept as central figures only, the designs being used to ornament round them, whenever required.

Engraving on ivory is still practised in Travancore. On Plate I is represented the palanquin used by His Highness the Máharajah. It is about fifty years old, and is entirely covered with plates of ivory, on which many of the designs described are engraved.

I am informed that palanquins ornamented in this way, and figures carved in ivory, worked by goldsmiths over two hundred years ago, are still found, though rarely, in the palaces at Trivandrum, Shunganacherry, and Haripad; also in some Pagodas in North Travancore, in the houses of rich Namburis, and in the mutts of Namburi Sanyasis. But, though this was the main use, in these earlier days, to which ivory was first put, no doubt there were scattered here and there goldsmiths who occasionally carved figures of the gods in ivory, and also Namburi Brahmins, who, in their leisure hours, amused themselves by doing the same. But it was due to the direct encouragement of the rulers of the State that the art was finally established in Travancore.

In the early days of the Rajah who ascended the throne in 1829-30, certain Namburi Brahmins from North Travancore brought for the Rajah's inspection figures of the gods and of sacred animals carved in ivory, of so minute a size that they could be enclosed in a paddy husk.[2] What made the work the more remarkable was that the only tool which these Brahmins used to accomplish the task was a small knife. The Rajah was so

[1] Ivory takes a variety of dyes well, without interfering with the polish of its surface. The actual matrix is stained, and the colour is not merely due to the penetration of pigment into the open dentine tubes.

[2] Colonel Olcott recently showed me a figure of Buddha beautifully engraved on a rice-grain—E.T.

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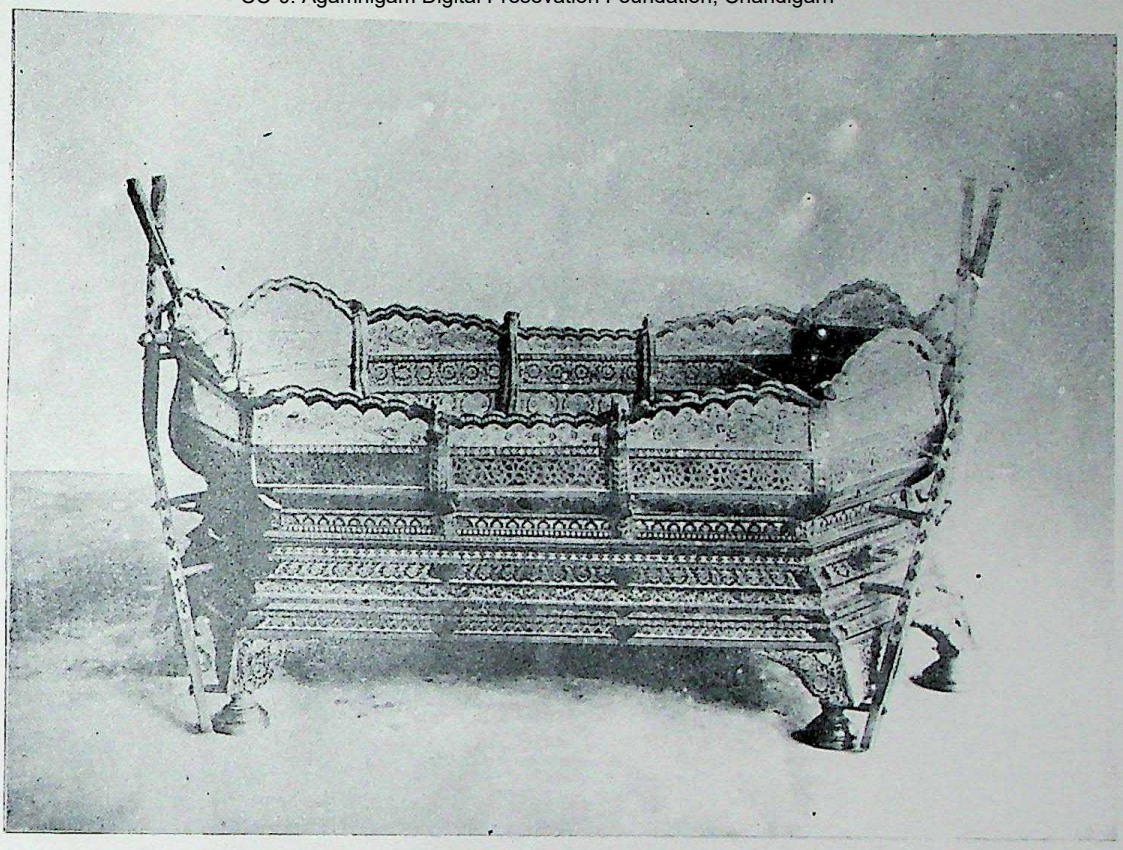

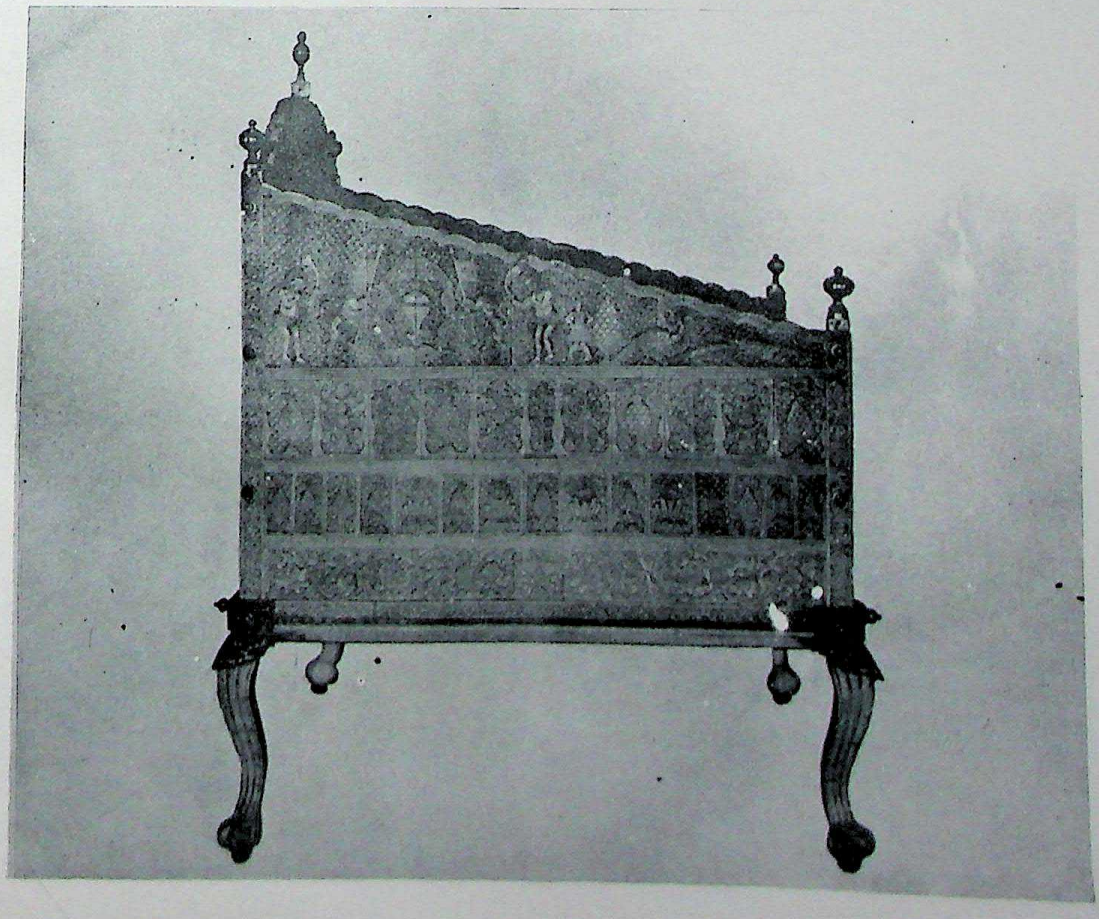

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pleased with their ingenuity that he presented them with gold bangles as a mark of honour. Whether the Rajah's taste for art was aroused by the sight of this work, or whether it was already established, and, being known to the Brahmins, had caused them to bring their work with the certainty that it would be appreciated, it is impossible to say. But it is certain that the Rajah Ráma Varma gave great encouragement to ivory carving. Goldsmiths from Tiruvankode in the south, and Haripad and Shunganacherry in the north, were employed on account of their technical knowledge; and, as carving in wood had long been practised by men of the carpenter class, the services of men of this class also were enlisted. The most important work that they did was to design and execute a throne in ivory. This was used by the Rajah at durbars, and still lies in the old durbar hall in the Fort at Trivandrum. The throne is almost square, supported on four solid legs. The back rises to a height of three feet and a half. The breadth is four feet, and the depth slightly more. The sides are solid, and slope to the front. The whole of the interior of the back and arms is covered with ivory plates of different sizes, engraved, in the way I have already mentioned, with conventional designs. The exterior is similarly covered with thicker plates carved in low relief. The arms of the State (the sacred conch)[1] are carved on the back and on both sides, but the supporters are different from those now adopted, being tigers, more or less grotesque, instead of elephants. Figures of dancing girls in various attitudes, parrots, dragons, pine-apples, and other designs fill the remaining panels. One side of the throne is shown in Plate I.

The throne is an interesting specimen of early Travancore work, but lacks the delicacy of finish, which characterises the more modern.

Many other minor works were executed, and the liberality of the Rajah kept the men, especially those of the carpenter class, constantly employed, so that one or two families became professional carvers, and still continue to do the same work. Rajah Ráma Varma died in the Malabar year 1022 (1846–47), and was succeeded by Rajah Marthanda Varma. He showed the same interest in the art that his predecessor had evinced. In 1851 he sent as a present to Her Majesty the Queen an ivory throne, elaborately carved, and set with jewels. It was exhibited at the Great Exhibition in London in that year, and was much admired. It is a beautiful piece of work, thoroughly Indian in design, much more finished than the one made in his predecessor's reign, and worthy of the purpose for which it was intended. It now finds a fitting place in the State apartments at Windsor Castle.

On the death of Rajah Marthanda Varma in 1036 (1860–61), ivory carving was still carried on in the palace under the patronage of the Máharajah. His brother, who afterwards succeeded him, and was then first Prince, also employed carvers on his own account, while Dewan Madhava Row (afterwards Sir T. Madhava Row) also had men who worked privately for himself. Specimens[2] of the work were sent to various exhibitions in India and Europe, and the fame of Travancore ivory carving was thus spread abroad.

So many enquiries and orders came in, that at last it became necessary to start a department of ivory carving under the Government. This was done in 1048 (1872–73). The staff consisted of a designer, an assistant, a clerk, and nine carvers, whose combined salaries amounted to one hundred and twenty-nine rupees per mensem. For sixteen years the work was successfully carried on, and many beautiful specimens were turned out. Convicts in the jail, who showed any taste for carving, received instruction, and some private persons started work on their own account. In 1063,[3] Mr. K. Narayana Iyer was sent to Madras to study the working of the School of Arts there. He returned towards the middle of the next year, and was appointed Superintendent of the newly-instituted School of Arts in Trivandrum. The establishment of ivory carvers from the Huzur Catcherry was taken over, and became a branch of the Industrial School under his superintendence. The family of Tiruvankode goldsmiths, who had been employed in ivory work on a small scale, is now almost extinct. The goldsmiths of Shunganacherry and Haripad have, for the most part, left off carving, and reverted to their original metal-work. There are still several Namburi Brahmins, who carve in ivory, but only for amusement, as they are not professional workmen, and do not sell their work. The Elaya Rajah gives encouragement to the art by the employment of some carvers; and there are a few persons who practise on their own account, who have been instructed in the Industrial School. But ivory carving is chiefly carried on in the school itself.

The carving, as I have said, was at first confined to the production of the conventional figures of the Puranic deities, which are admittedly unsuitable for the higher forms of artistic representation, but into these

[1] The conch, sankhu, or chank shell (*Turbinella rapa*).

[2] An admirably executed ivory tankard, silver-mounted, the property of Sir T. Madhava Row, is figured in Hawkes' 'Photographs of Madras and Burmese Artware,' 1886, Plate 10—*Vide* also 'Photographic Illustrations of Selected Objects, Simla Exhibition,' 1881, Plates VIII, XXXVII.

[3] 1063 commenced on 15th August 1887. The Malayális compute their time by the Kollam era, which is reckoned from the supposed date of the foundation of the town of Quilon or Kollam.

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even it was possible to put a degree of finish, and an elaboration of detail that rendered the work of Travancore distinguishable for its artistic quality. Wood carving had long been practised, being as ancient as the temple architecture, and a naturalistic style had sprung up in Travancore, which was happily applied to relief work in ivory.

Plate II shows the ivory portion of a vase without its setting. On one side is a representation in relief of the very interesting Tulabharam [1] ceremony. The other side shows the Máharajah engaged in the Palli vetta ceremony, or shooting the cocoanut; a ceremony annually performed with much pomp in Trivandrum.

Plate III shows the top, back, and one end of an oblong ivory box. The State car is seen, standing before the palace, with the gopálan of the temple in the distance. On the back of the box the landing place in the fort, with boats (jangadams), is carved. On the end is a group of musicians with their various instruments.

On Plate II are shown two vases, on the first of which a State procession winds its way in a spiral round the vase, while the second is a scene from nature—the landing-stage from the backwater at Bolghatty in Cochin.

In the School of Arts this style of work is used for the decoration of many articles of European use, such as the backs of brushes, hand-glasses, combs, book-racks, etc., and is eminently adapted for such a purpose.

At one time English designs were partially followed; but, since the institution of the school, a reversion has been made to good old Indian designs, the excellence of which in decorative art is now thoroughly appreciated. A collection of designs from the different pagodas in the State has been made, and proves very useful.

The following table shows the value of the work turned out since 1056 (1880-81):—

In the Huzur Catcherry.

Year.	Value of articles manufactured. Rs.	CH.	C.
1056	1,108	13	14
1057	1,434	20	10
1058	1,097	26	3
1059	1,286	9	8
1060	761	2	7
1061	616	14	3
1062	546	10	10
1063	1,042	10	1
1064	2,189	14	12

In the School of Arts.

Year M.E.	Ivory used for work. Quantity. LB. OZ.	Value. Rs. CH. C.	Value of articles manufactured. Rs. CH. C.	Value of articles sold. Rs. CH. C.
1065	143 13½	878 13 5	3,003 22 14	1,357 24 9
1066	132 2½	807 2 12	1,378 25 10	1,009 9 13
1067	91 1	556 3 11	1,391 17 9	1,008 7 13
1068	134 4½	820 2 2	2,534 17 9	2,182 22 8
1069	79 14½	488 2 2	1,940 3 10	2,232 1 12
1070	77 7	472 25 13	2,346 6 4	1,499 8 11
1071	107 3¾	654 25 2	2,163 15 2	2,136 16 15
1072	80 8	489 20 1	3,895 27 2	4,092 26 8
1073	74 15½	457 7 3	4,003 2 12	2,812 13 14
1074	93 15	573 19 5	2,949 12 9	1,303 22 2

[1] The ceremony in which the Máharajah, after his accession, is weighed against gold coins struck for the occasion, and distributed among the officiating priests and Brahmans.

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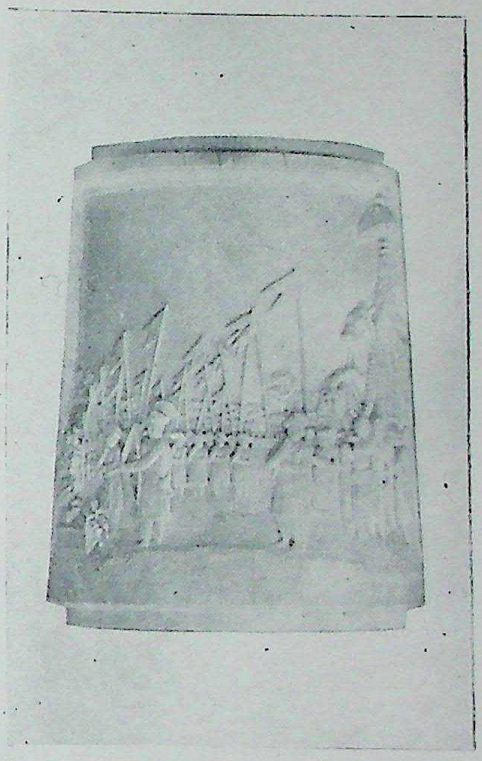

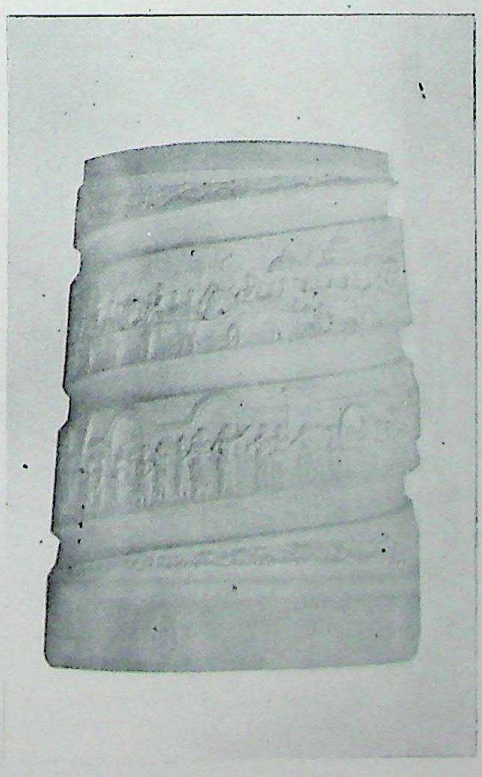

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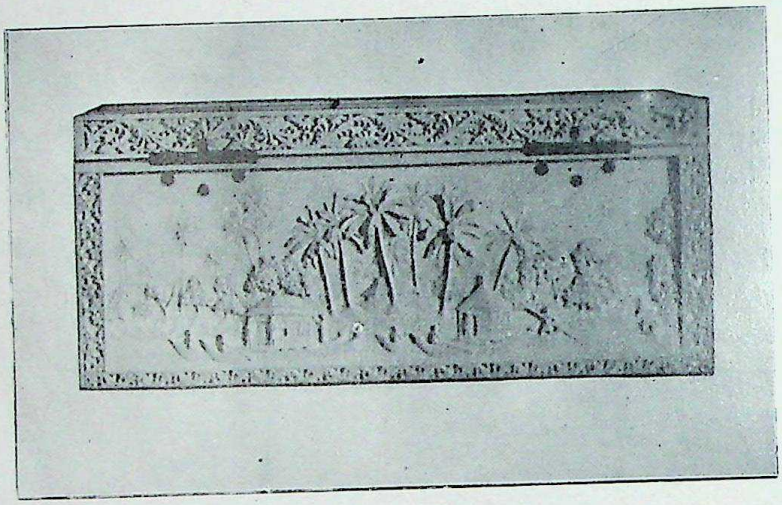

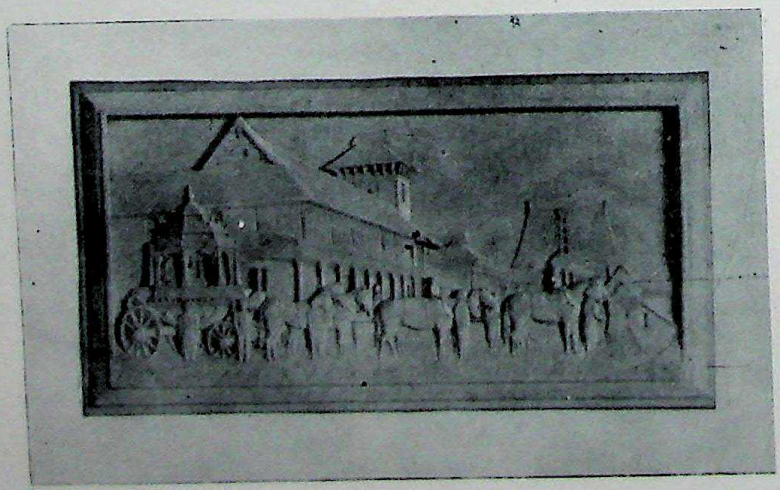

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The accounts are kept in rupees, chuckrams, and cash. The figures show that there is a steady, though not a large demand for Travancore ivory carvings; and it is probable that, if steps were taken to advertise their excellence more widely, the demand might be considerably increased.

As to the source from which the material is obtained. Ivory has, for many years, been a monopoly of the Government, but there are no records to show when it was first made so. No ivory is imported. Travancore depends for her supply on the elephants that are found in great numbers in her forests; and the amount obtained is amply sufficient for all her requirements.

By the Travancore Forest Regulation the ivory of wild elephants, whether grown or found upon Government land or private property, is a royalty, and no trade shall be carried on, unless it has been obtained from the Government. Whoever, unless authorised to do so, kills, wounds, or captures a wild elephant within the territories of the State, shall be punished with imprisonment which may extend to three months, or with fine which may extend to five hundred rupees, or both for each animal; and the tusks and teeth of the animals which have been killed, or the elephants that have been captured, shall be regarded as the property of the Sircar, and shall be delivered to the nearest Forest officer or Police officer. Provided that our Dewan may, from time to time, on an application being made to him, grant general or special permits in writing for the shooting or the capturing of elephants.

Elephants have been more or less protected by the State for a long time. Mr. Bourdillon, the Conservator, says in his report on the forests:—"Lieutenant Arthur, in his memoir of Travancore written in 1810, mentions that, at that time, Government used to allow people to cut pits for these animals on payment of a tax per pit. The elephants thus taken apparently became the property of the persons who dug the pits. Subsequent to 1810, Government commenced digging pits on its own account; but it was still allowable for private persons to have *indm* pits, as they were called. The elephants thus captured by private persons had to be sold to the Government at Rs. 150 a head." A tax on cutting pits in which to capture them was thus the first means adopted for the protection of elephants. It was not till the year 1869 that it was found necessary to prohibit their being shot. This, no doubt, was necessitated by the opening up of the country, and the influx of Europeans to the hills for the purpose of planting coffee. The sixth paragraph of the notice prohibiting the shooting of elephants runs as follows:—"In any case the tusks and teeth . . . . of wild elephants, however death may have occurred, will as hitherto be the property of the Sircar, and are deliverable to the nearest Police officer." This shows that the monopoly of ivory had been recognised for some time previously. Tusks found by private persons may be delivered to the nearest Government officer. Any officer who takes charge of them forwards them to the Huzur Treasury. By these means about eight tusks a year are received. It is the duty of the Forest Department to collect ivory, and to forward it to the Commercial office at Alleppey, where it is sold by auction annually. The Kanikars, or hillmen, bring in many; and some are taken from animals that have been caught in pits and died. A *kolvila*, or reward, is given for all tusks brought in; and the tusks are divided into four classes, for which different rates of *kolvila* are paid as follows:—

Class 1, 18 lb. and over	$\frac{\text{Fanams } 126}{\text{Bh. Rs. } 17\text{-}10\text{-}10{\cdot}37}$	per thulam.
„ 2, 10—18	$\frac{\text{Fanams } 94\frac{1}{2}}{\text{Bh. Rs. } 13\text{-}4\text{-}2{\cdot}53}$	do.
„ 3, over 7—10	$\frac{\text{Fanams } 63}{\text{Bh. Rs. } 8\text{-}13\text{-}5{\cdot}68}$	do.
„ 4, under 7	$\frac{\text{Fanams } 31\frac{1}{2}}{\text{Bh. Rs. } 4\text{-}6\text{-}9{\cdot}85}$	do.

N.B.—A thulam is equal to 30 Dutch pounds or nearly 20 English.

The weight of tusks delivered by the Forest Department at Alleppey each year averages about 24 thulams, *i.e.*, 480 lb. roughly. But, says Mr. Bourdillon, "sometimes elephants die in large numbers, as in the year 1866, when a murrain attacked them in the forests near Malayattur, and fifty pairs of tusks were brought to the Forest offices at that place and Thodupuzha in April and May."

An average tusk weighs about 10 pounds. The largest ever received by the Government weighed 75 pounds.[1]

[1] "Tusks vary greatly. The longest recorded, I believe (Sir V. Brooke's from Mysore), measured 8 feet and weighed 90 lb.; but a shorter tusk from Gorakhpur is said to have weighed 100 lb. Both were from elephants with but one tusk perfect. Two pairs from the Garo hills (Assam) are said to have weighed 157 and 155 lb., respectively."—'Blanford. Faun. Brit. Ind.'

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The average price, which Travancore ivory has realised from the year 1875 to 1900, is S. Rs. 5 per pound.

The subjoined table shows the amount of tusks exported from 1890 to 1900:—

Years.	Number of tusks received in the Commercial Office for 10 years.	Total weight in lb. of tusks received.	Total weight in lb. of tusks sold.	Total weight in lb. of tusks exported from Alleppey.	Total weight in lb. of tusks sold and kept in Travancore supposing that ivory was exported only from Alleppey.	Average price per lb.	Remarks.
						Rs. A. P.	
1066	68	469	423	196½	272¾	4 10 8	
1067	53	668	572½	91	577	6 6 4	
1068	57	674	579½	106⅞	567⅛	6 5 5	6 tusks sent to the Huzur.
1069	92	700½	684	836½	..	5 14 7	19 do. do.
1070	56	835	909¾	773¾	61¼	6 1 7	
1071	74	570	592½	354	216	6 8 11	
1072	78	1,212	1,313½	963½	248½	4 8 5	
1073	61	746¼	771¾	548	198¼	5 14 11	
1074	70	1,160½	1,033	536⅞	623⅛	3 9 10	20 tusks sent to the Huzur.
1075	84	844⅓	956½	125½	719	..	All tusks sold by auction; not exported yet.
Average of 10 years .	69·3	Average for 1 year 788 lb.	Average for 1 year 783½ lb.	Average for 1 year 453½ lb.	Average for 1 year 334½ lb.	5 0 0	

To the Madras Fine Arts Society Exhibitions, 1899 and 1900, the artisans of the Elaya Rájah of Travancore sent ivory carvings of antelopes, deer, Vishnu at the deluge, Venugopâl Krishna, a hunting scene with a mixed herd of pigs, rabbits, and deer; hair-combs with the arms of Travancore, and the lion of Lucerne. None of these, however, equal, in artistic delicacy of treatment, a figure of Vishnu at the deluge, by a former Travancore ivory carver, which is reproduced in 'Photographs of Indian Art Work in the Calcutta International Exhibition,' 1883–84. Of this exquisite little figure (Plate VII) I was fortunate enough to obtain an example at the recent Madras Exhibition, whereat several loan collections bore evidence to the fact that ivory carving in Southern India was at a higher level of excellence than it is at the present day.

Through the courtesy of Rajah V. Vasudeva, Rajah of Kollengode, I have been able to inspect a series of ivory carvings made by artisans in his employ, which comprise Krishna, Ganesa, and Subramaniya, dogs, lions, deer, and other animals. Some of these carvings are represented in Plate VII.

Concerning Vizagapatam work in ivory, bison and stag horn, and porcupine quills, Sir George Birdwood writes[1] that it "is applied to the same class of articles as Bombay inlaying, namely, work-boxes, tea-caddies, desks, chess-boards, and a variety of fancy articles. It is of a very recent origin, and the etching in black, *sgraffito*, on the ivory, is exclusively of European flower forms, represented naturally, in light and shade. The effect is seldom pleasing."

In a list of ivory articles made at the present day at Vizagapatam the following are enumerated: glove-boxes; handkerchief boxes; money boxes; envelope cases; blotting books, book-stands; stamp boxes; card-cases; jewel and work-boxes; chess-boards, and picture frames. A chess-board (price Rs. 800), made of sandal-wood, ivory, and tortoise-shell, which was exhibited by Messrs. Golthy Lutchmiah at a recent Exhibition in Madras, is represented on Plate IV. The etching in black in this, as also in other articles which were exhibited, represents various Hindu deities as well as floral devices. From a report which was received in connection with the preparation of this monograph I gather that the ivory-wares are exported to Bombay and Madras on a large scale, and to Calcutta on a small scale. The demand is, however, said to have diminished of late owing to plague

[1] Industrial Arts of India.

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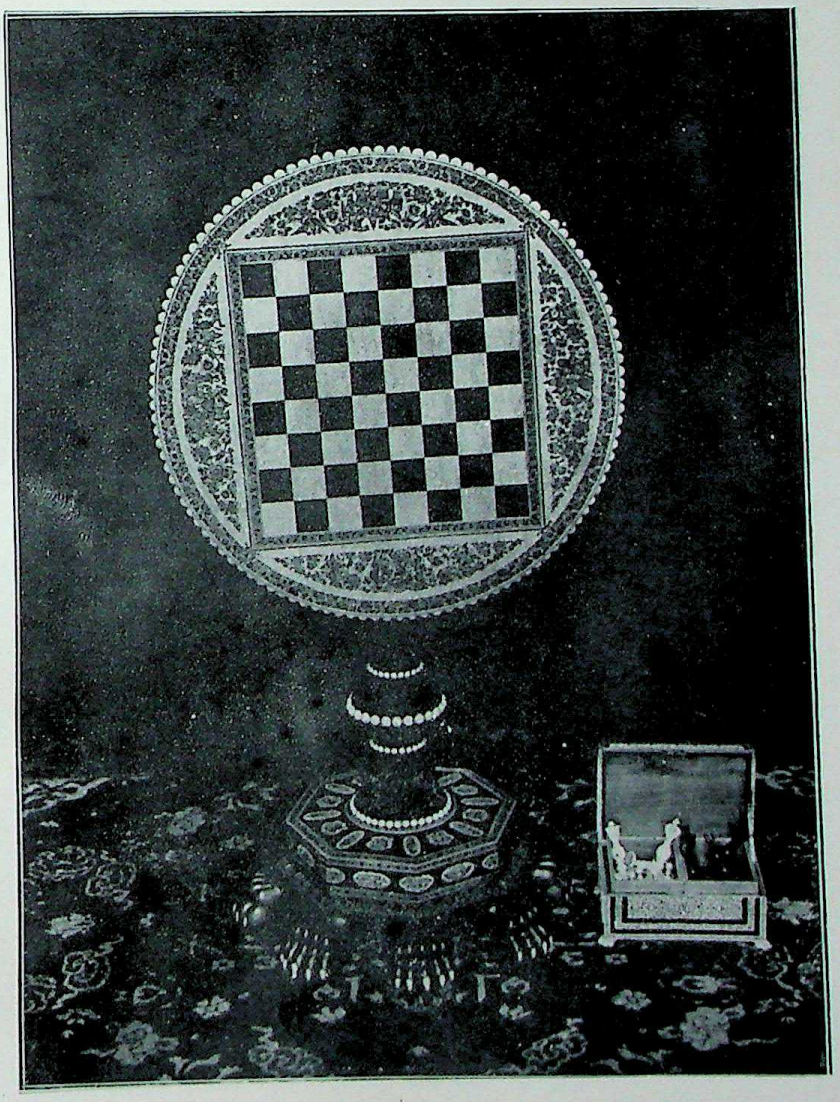

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and famine. The ivory is obtained from Bombay and Calcutta, and brought by Marwaris to Vizagapatam for sale at the following prices:—

	Rs.
First sort, *i.e.*, big white pieces without cracks	140 per 25 lb.
Second sort, *i.e.*, small pieces with cracks	100 do.

The process of etching in black is described as follows in the report under reference. Melt 4 tolas of good red wax (lac) with ½ tola of lamp black, or soot from a gingelly (*Sesamum indicum*) oil lamp. Let the melted composition become somewhat thick, and draw it out into thin threads about six inches long, and allow them to become hard by cooling. Take a portion of one of these threads, and place it on the already engraved portion of the ivory. Then beat it with a red-hot poker till it becomes liquid, and fills in the engraved lines, which then become black.

One of the ivory-ware merchants of Vizagapatam informs me that he buys ivory from Marwári traders, who obtain it from Bombay and Calcutta. Very rarely a small supply can be obtained locally in the Vizagapatam district. The larger tusks, weighing more than 2 or 3 maunds (of 25 lb.), are usually brought from Bombay. The price of the first sort of ivory ranges between Rs. 110 and Rs. 120 per maund, and of the second sort between Rs. 80 and Rs. 100. The artisans, who manufacture the ivory-wares, belong to the Viswakarma or carpenter caste, and are pure vegetarians, unlike the Tamil carpenters. There are between fifty and sixty families in Vizagapatam, who are engaged in the industry. A good workman is paid Rs. 30 per mensem. The trade is flourishing, as there is a good demand for the wares from merchants at Vizagapatam and Madras. The black figures and lines, my informant tells me, are made in the following manner. The 'ink' is prepared by mixing the soot, obtained from a lighted cotton wick dipped in gingelly oil and held beneath a metal vessel, with melted lac. The design is drawn on the smooth ivory surface with a lead pencil, and engraved with a sharp etching needle. The ink is then rubbed over the surface with the fingers. When the ink is dry and hard, the whole surface is scraped with a sharp chisel or plane, by which means all the ink is removed, except that which adheres to the engraved portions. By this process a polish is also given to the surface of the ivory.

The names of firms of ivory-carvers at Vizagapatam at the present day, which have been submitted to me, are Lala Venkatadoss, Sivacooty Chundraya, and Golthy Lutchmiah. A variety of articles in ivory fret-work on black or sandal-wood, and *sgraffito*, in the Madras Museum collection, were made by G. Chinnaveeranna.

At Dhowleshwaram, in the Gódávari district, an ivory-carver, Salendam Viswambharam by name, manufactures sundry articles in pure ivory or ivory and sandal-wood, which include idols, paper-cutters, rulers, ink-stands, chess-boards, combs, card-cases, paper-weights, etc. He generally works to orders received from Europeans or Zemindars, but also takes his wares for sale at Hyderabad, Madras, and other places. He usually obtains the ivory from Marwári traders at Hyderabad.

Turning lastly to the Mysore Province, I cannot do better than quote extracts from a note on 'Ebony carving inlaid with ivory' by Mr. J. Cameron, who writes as follows:[1] "In Mysore this art is at present confined to a very narrow circle, being practically in the hands of a small Mahomedan firm employed in the city of Mysore under the immediate auspices of His Highness the Máharajah. But there is evidence that the art flourished to some extent in former times, and not improbably the original craftsmen were adventurers from the north, who followed successful leaders in the fortunes of war, in view to practising this craft during the intervals of peace.

"It can be easily imagined that an expensive industry such as inlaying could only be developed under the patronage of successful rulers and wealthy chiefs. The Mahomedans enjoy the credit of having introduced the art to Mysore, but there are no data to show when or how this happened: while, on the other hand, we possess relics showing that the ornamental application of ivory was well known to the early Hindu kings. But Mahomedan emigrants may have worked under the latter from an early period, as there can be no question of their hereditary skill in this class of work. The inlaid doors in the mausoleum at Ganjám—the gift of Lord Dalhousie, and a facsimile of the original doors which had decayed—is a fair example of work done in Típu's time. The late Máharajah of Mysore occasionally employed a few skilled workmen in the palace at Mysore, but, with this exception, the art of inlaying has been steadily on the decline for more than half a century. At present there is a slight tendency to triviality of design, or, what is worse, a mixture of oriental with the occidental. This

[1] 'Journal of Indian Art,' vol. IV, 1892.

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should be avoided at all hazards, and, when orders are received from abroad, designs should accompany them, or at least be fully approved by the purchaser before they are carried into effect. But there should also be a good consulting album of select oriental patterns, as every one who purchases is not in a position to design even his own requirements; and a difficulty here presents itself in regard to the nature and scope of such designs. If Mahomedans solely are employed in the work, their religion forbids the portraiture of human figures and most animals, and hence we lose the charming effect of historical sketches, as also of mixed natural scenes, where fragments of the animal and vegetable kingdoms are usually combined. But some arrangement should be made to surmount this difficulty, as boldness and originality of design will go far to popularise this class of art. A first-class draftsman, who is conversant with the prominent features of oriental sculpture and painting, should be specially employed in getting up the album."

The inlaid articles usually turned out at the present day consist of small cabinets, book-stands, teapoys, hookah-stands, picture frames, ink-stands, pen-racks, watch-stands, blotting pads, walking sticks, pen-holders, etc., some of which are figured in Plate VI. In Plate V are represented two handsome inlaid doors in the Máharajah's palace at Mysore.

GOVERNMENT MUSEUM, MADRAS,
May, 1901.

EDGAR THURSTON.

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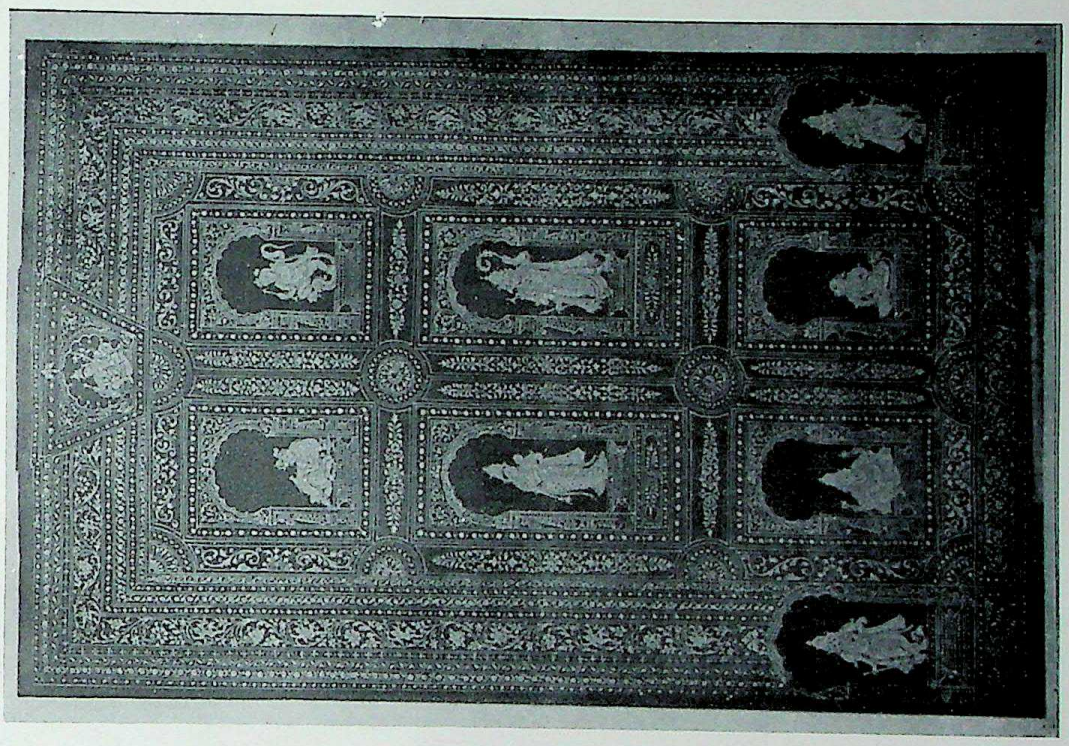

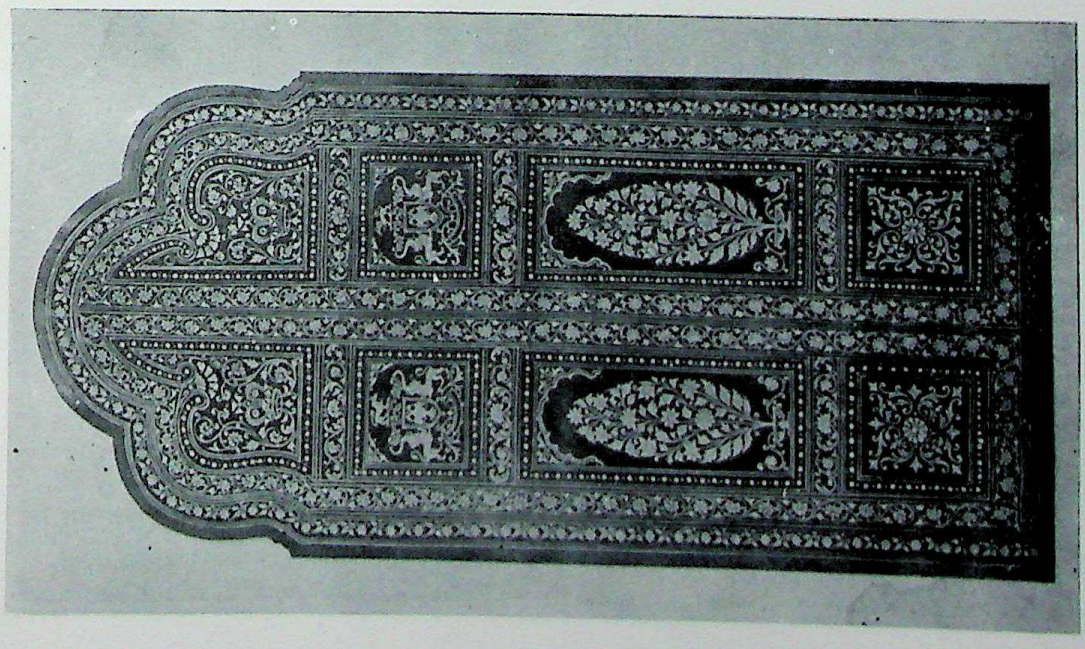

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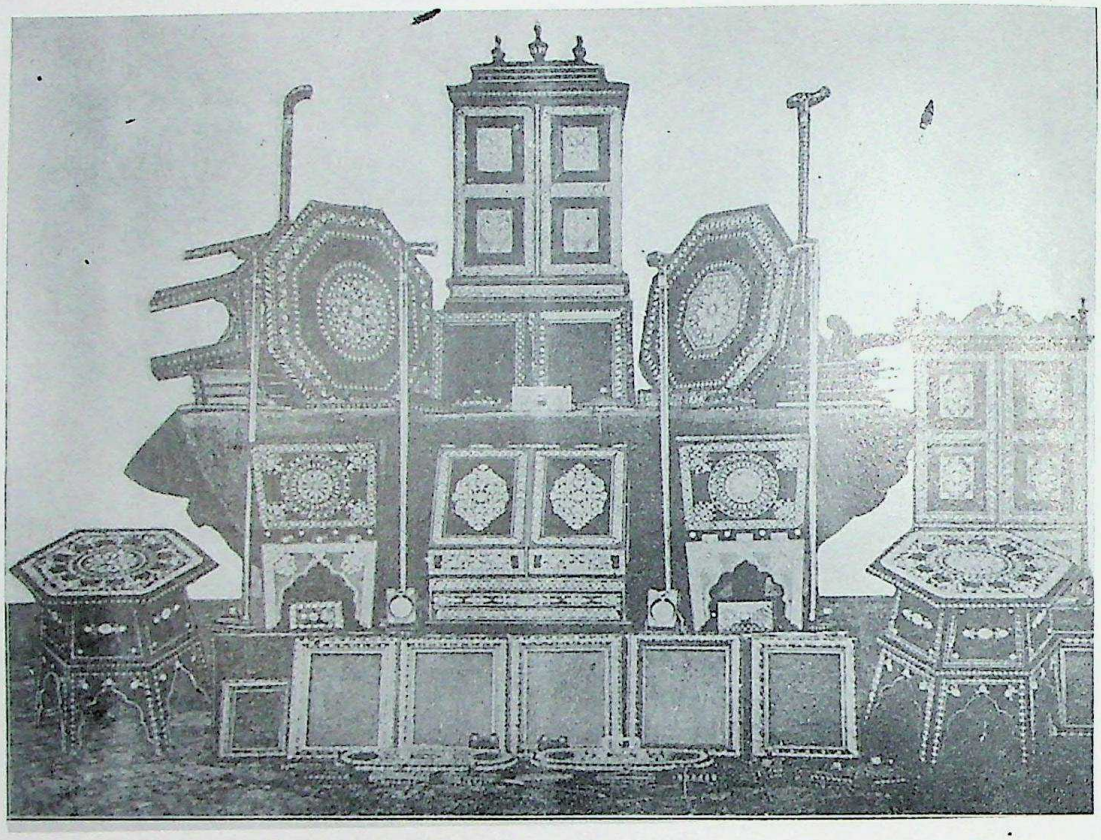

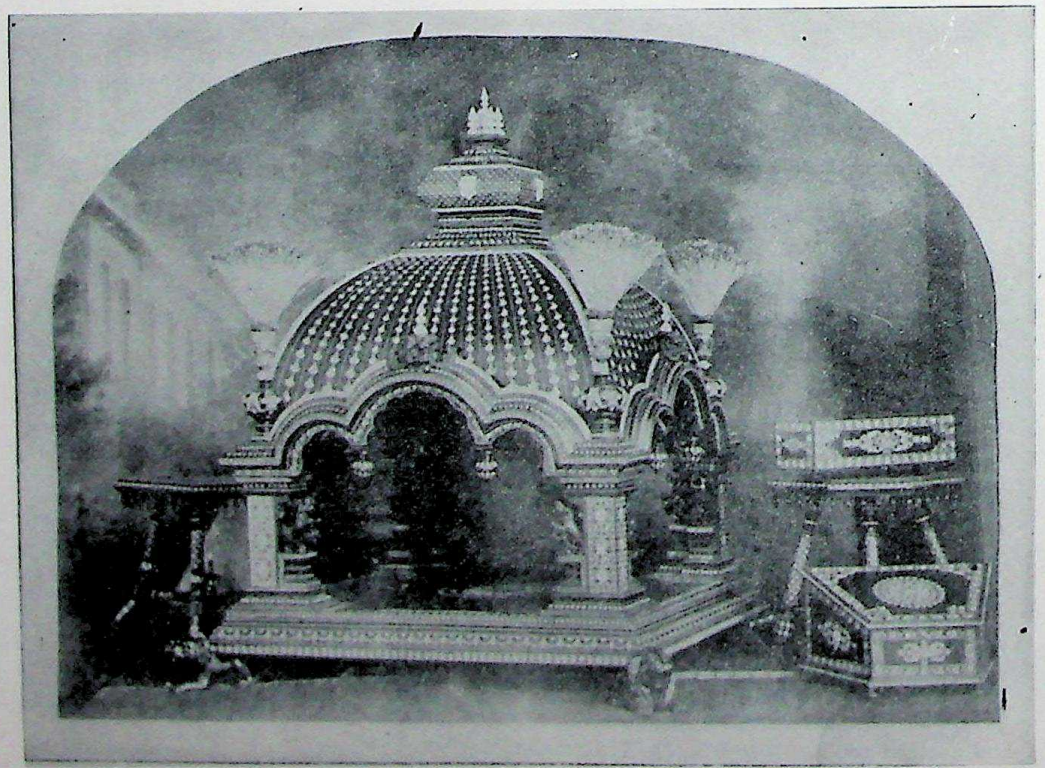

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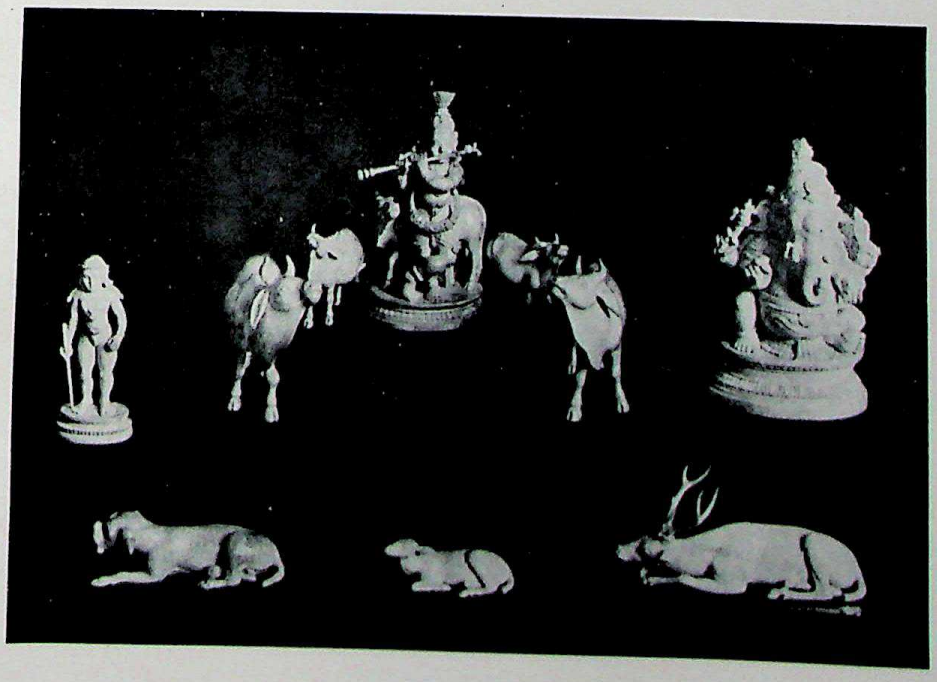

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The Cotton Fabric Industry of the Madras Presidency.

TWO admirable articles entitled 'The Industries of Madras' and 'The Printed Cotton Industry of India' by Mr. E. B. Havell, formerly Superintendent of the Madras, now of the Calcutta School of Arts, have, within the last few years, been published in the *Journal of Indian Art* (1888 and 1890). In these articles repeated reference is made to the decline of the indigenous cotton fabric industry, and the degree to which it has suffered from European competition. The scope of the series of monographs, to which I have been invited to contribute, being industrial rather than artistic, it is my duty, with a practical outcome in view, to emphasise and draw more prominent attention to this industrial decline, and the influences which have been at work to produce it.

When, as at the present day, the bazaars of Southern India are flooded with imported piece-goods of British manufacture (which, in conjunction with mineral dyes, must be the key-note to the present monograph), it is curious to look back and reflect that the term piece-goods was originally applied in trade to the Indian cotton fabrics exported to England. "In 1700," Sir George Birdwood writes,* "a law was passed, by which all wrought silks, mixed stuffs and figured calicoes, the manufacture of Persia, China, or the East Indies, were forbidden to be worn or otherwise used in Great Britain. It was particularly designed for the protection of the Spitalfields silk manufacture, but proved of little or no avail against the prodigious importation and tempting cheapness of Indian piece-goods at that time. . . . . Cotton was first manufactured in Scotland in 1676, and in Glasgow in 1738, and in Manchester the manufacture of printed calicoes was regularly established in 1765."

Exactly a century ago (1796–97) the value of piece-goods from India imported into England was £2,776,682, or one-third of the whole value of the imports from India, while the closing years of the present century find the indigenous cotton fabric industry of Southern India strangled by the octopus-like grasp of the enterprising and far-reaching British capitalist, whose influence is manifest even in remote up-country bazaars. The exports have shrunk into trifling insignificance, while the imports of piece-goods (cotton and linen) to the ports of Madras have, as shown by the subjoined statement, assumed vast proportions :—

	Rs.
1886	2,05,23,956
1887	1,96,98,864
1888	2,09,79,359
1889	2,42,34,708
1890	1,93,30,030
1891	1,74,86,221
1892	1,46,63,777
1893	1,84,21,285
1894	2,27,01,820
1895	1,94,59,073

The nature of the cotton and linen piece-goods imported will be intelligible, to those familiar with the commercial terms, from the following extract from the 'Statement of Imports to the Ports of Madras' during the month of March 1895 :—

		Rs.
Great Britain.	Chintz	4,22,966
	Grey shirting	7,92,871
	„ madapollam	8,500
	„ drill	31,821
	„ jaconets	1,63,590
	„ mull	1,27,561
	White jaconets	3,41,669
	„ shirting	92,691
	„ cambrics	77,773
	„ mull	1,78,221
	Book muslin	3,936
	Coloured muslin	33,818
	Turkey-red cambrics	1,05,115

* *Industrial Arts of India.*

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		Rs.
Great Britain—*cont.*	Turkey-red shirting	76,724
	„ mull	27,672
	„ coloured dresses	63,717
	„ printed scarfs	36,246
	Grey dhovettees	5,91,998
	White „	25,190
	Handkerchiefs	9,004
	Canvas	6,903
	Linen piece-goods	3,281
	Piece-goods, other sorts	2,894
Calcutta ..	Piece-goods, grey	2,675
	„ white	26,599
	„ coloured	9,054
Bombay ...	Piece-goods, white	8,363
	„ coloured	16,600
	„ grey	18,652
	Total ...	33,27,223

It is worthy of note that, while the imports of cotton piece-goods to the ports of Madras during the year 1895 were valued at Rs. 1,94,59,073 with a monthly average of Rs. 16,21,589, the exports thereof were valued at only Rs. 36,46,946 with a monthly average of Rs. 3,03,912. The value of the imports, in fact, exceeded that of the exports by the large sum of Rs. 1,58,12,127. The imports included very large consignments of Turkey-red fabrics (cambrics, shirtings, chintz, jaconets, mull, dresses and printed scarfs) valued at Rs. 23,87,166, Turkey-red twist valued at Rs. 35,44,554, and other coloured twist * valued at Rs. 18,83,232. Turkey-red (a mineral dye), which is largely responsible for the decline in the use of the beautiful vegetable red dyes in the dyeing of cotton fabrics, appears on the scene, so far as I can ascertain, for the first time in the official trade statement for 1866-67. The exports to Great Britain in 1895 included Madras handkerchiefs (which are repeatedly referred to in 'Uncle Tom's Cabin') to the value of Rs. 3,06,305, and Ventupallam handkerchiefs to the value of Rs. 2,200. Emigration of natives takes place from Southern India to Natal, Mauritius, the Straits Settlements, Ceylon and Burma, and there is a consequent export to these countries of cotton fabrics adapted to the fashion and requirements of the emigrants, who, in their voluntary exile from home, welcome the familiar Madras handkerchief, dhovettee, etc. The yarn used at the present day in the manufacture of good Madras handkerchiefs is dyed with seruver (*Oldenlandia umbellata*—chay-root or Indian madder) or with Turkey-red and surúl-pattai (*Ventilago Madaraspatana*); and I am told that these handkerchiefs fetch a considerably higher price in the foreign market when made with country-dyed yarn than with yarn dyed in Europe, because they are exported for sale to Madras natives working in British colonies, who prefer the original vegetable colour to the modern hybrid imitation.

Very intimately connected with the cotton fabric industry of Southern India at the present day is the employment of aniline and alizarine dyes, the imports of which have, as shown in the following statement, rapidly increased in value from only Rs. 20,868 in 1886 to Rs. 3,06,649 in 1895 :—

ANILINE AND ALIZARINE DYES.

Imports to the ports of Madras from Great Britain, Hamburg, Antwerp, France, Trieste, Bombay and Calcutta.

	Rs.
1886	20,868
1887	20,803
1888	28,447
1889	69,900
1890	1,21,896
1891	1,42,945
1892	2,20,167
1893	2,23,630
1894	2,45,361
1895	3,06,649

* It is pointed out in the 'Annual Statement of Trade and Navigation, Bombay Presidency,' 1895-96, that the large imports of dyed yarns from Austria and Belgium may be accounted for by the reduction of the duty on dyed yarns to half per cent. on 25th May 1895, and that all yarns have been exempted from duty by the Tariff Act of 3rd February 1896.

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In his ' Review of the Trade of India,' 1895–96, Mr. J. E. O'Conor states that the dyes imported into India "are mainly alizarine, of which 5,072,101 lb. were imported, little more than half that quantity (2,693,272 lb.) being aniline. The dyes are mostly of continental origin, as will be seen from the principal sources of supply noted below ; indeed it is not certain that even the small proportion received from the United Kingdom is not continental :—

	1895–96. LB.
United Kingdom	487,588
Belgium	4,581,441
Austria-Hungary	616,827
Germany	584,070
Holland	1,151,225
Italy	336,493

"The total value of all the dyeing and tanning materials imported was Rs. 8,58,893, alizarine and aniline dyes being represented in that sum by Rs. 7,03,900, being about 82 per cent. of the whole."

I learn further from the ' Annual Statement of Trade and Navigation, Bombay Presidency,' 1895–96, that "the bulk of aniline and alizarine dyes is shipped from Belgium (Antwerp), but Holland (Amsterdam) now has a very large share of the alizarine trade. In both cases the goods are mostly of German manufacture. There has been a brisk demand for these dyes for dyeing silk and cotton goods, and new markets, both in and out of India, are being opened up, while low prices have ruled. Alizarine is now largely imported in lumps, and the better classes of aniline are growing in favour. It is said that numerous new companies are starting in Germany, so that still lower prices and larger imports may be expected."

In explanation of the names aniline, alizarine and Turkey-red, I may quote the following note, which was drawn up for me by a chemical expert: "Turkey-red received its name from the fact that the madder root (*Rubia tinctorum*) was largely grown in, and exported from, Turkey and the Levant. The active principle in madder is alizarine, which is obtained from it by a fermentative process somewhat akin to that by which indigo is prepared. After the synthetic production of alizarine from anthracene, the natural source of the dye ceased very largely to be drawn on, and the cultivation of madder is now almost, if not entirely, obsolete. All the Turkey-red dyeing is now done with artificial alizarine; and, in addition, there are dyes of almost every variety of shade, especially blacks, browns, purples, reds, and yellows derived from the same source. By aniline dyes, strictly speaking, are meant only those derived from aniline, and the number of them is very large. But, in a wide sense (a popular one only) it is applied to an enormous number of artificial dyes, derived from a great variety of coal-tar products. There are thousands of them. The chemist refers to them all as synthetic dyes."

As in England, so in Southern India, fashion plays an important rôle in connection with native dress, both male and female. The assumption of the turban by the autochthonous Todas of the Nilgiris; the replacement of the tribal turban of the Badagas by knitted night cap of bright red or orange hue; the pork-pie cap, beloved of native student, and oft-times ornamented with monstrous knitted flower pattern ; the unstarched white shirt, patent leather boots, and white socks of the Bengáli Bábu clerk; the adoption by native cricketers of machine-made coloured blazers, as evil in colour contrast as those of many a house eleven at an English public school, are but a few examples of modern change in native male attire for the worse. Quite recently I was shocked by the appearance of a member of my staff in a new patch-work white shirt adorned with no less than six individual and distinct trade-marks, representing the Prince of Wales, Britannia, an elephant, etc. A native of the labouring classes, when clad in plain white loin cloth stained with indigenous seruver dye, and white or seruver-red turban, is, to my mind, far better dressed than when his turban is dyed with Turkey-red, and the loin cloth is of white imported fabric with the much-prized trade-mark, or replaced by unseemly pantaloons made of some gaudy imported piece-good. No longer does the jungle tribesman, who has emerged from his uncivilised condition to work for regular wages on planters' estates, rest content with a simple country-made cloth around his loins, but appears, on high days and holidays, clad in turban or cap and woven coat of English cut. And, on the occasion of a recent visit to the village of a hill tribe, I found the entire male community dressing in gorgeous apparel for a sacred festival in a neighbouring grove, and painting their faces with sect marks with the aid of miniature looking-glasses and coal-tar dyes, which, with imported fabrics, are exposed for sale at their weekly market.

Between fashion in female dress in England and Southern India there is this marked difference, that, whereas in England change in form (with the bloomer and bicycle costumes as extreme examples in modern times) is the most conspicuous feature, in Southern India, while the shape of the sári, jacket and petticoat have remained unaltered, a radical change has taken place, in recent years in both design and colour owing to the

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wide-spread introduction of imported printed fabrics, which now constitute a conspicuous feature of bazaars throughout the Madras Presidency. Three primary factors are mainly responsible for guiding fashion so far as native female dress in Southern India is concerned, viz., novelty, the quaint or grotesque, and artistic beauty. And the least concerned, in these days of the decline and fall of South Indian industrial arts, is artistic beauty. The love of the grotesque, which prevails among the natives of Southern India, is best illustrated by the carvings on Hindu temples, and by mythological paintings, and is responsible for the demand for the eccentric devices for female dress, with which the bazaars are now stocked, and which are disseminated, through the medium of weekly fairs or markets, to remote places which do not rejoice in the equivalent of milliner's shops.

The value of an average piece of imported British printed cotton fabric will, I am told, run to about nine rupees. Of a particular set of printed fabrics, which are imported into Madras from Manchester or Glasgow, the native merchant, who really commands the situation, may find one pattern which takes on with the natives, and can be disposed of in large quantities for fifteen rupees per piece with a resultant wide margin of profit. But, for some reason, after a successful run, the piece has to be taken off, as the demand for the particular pattern comes to an end in favour of another. The result is that the merchant has stored in his godowns cases of fabrics, which originally sold for fifteen, but for which he cannot get even three rupees. There is, however, a steady demand for a certain number of stock patterns, which have a ready sale at a price which leaves a moderate margin of profit.

In addition to new and showy design, which will captivate the native eye, the ticket or label on each piece is an important element of attraction, and as much ingenuity is displayed in the production of the grotesque on the ticket as on the fabric. And I have before me, as I write, a glazed label depicting a group composed of a native lady with turmeric complexion, clad in a pink sári, seated on a maroon cushion, and engaged in conversation with a naked little boy blue, while a chubby pink child looks on round the corner of a violet purdah.

We are now-a-days familiar, through the medium of the papers, with litigation in connection with trade-marks in their commercial aspect. A few months ago an incident occurred, which related to trade-marks in their religious aspect. A public meeting of Muhammadans assembled in the mosque at Ootacamund with a view to taking steps to present a petition to the Governor to stop the importation of a certain brand of cigarettes made in Germany, as the trade-mark represented a bird of paradise and the kalima (the Muhammadan confession of faith) round its neck as being an insult to Muhammadans.

Moochees (designers) are kept constantly employed by piece-goods merchants in devising and painting new patterns for despatch to Europe, which are freely canvassed and criticised with a view to selection or rejection. Those selected are sent to Manchester or Glasgow, and there engraved on copper cylinders, which constitute a very valuable portion of the plant of print-works.

The *raison d'être* of the gaudy eccentricities of device in female apparel, men's shawls, and turbans, which are now endemic in the bazaars of Southern India, is the endeavour on the part of the merchant to secure a fabric, which will be attractive, and command an extensive sale combined with a large profit. For example, only a few months ago a fabric, intended for making up into female petticoats, arrived in the Madras market, with a pretty flower and bird device on a ground of two shades of red, with a wondrous border composed of an endless procession of white bicycles of ancient pattern with bright green gearing and treddles, separated from each other by upright stems with green and yellow fronds growing out of a conventional border. And the manner in which the bicycles were worked into the design was undoubtedly clever. In another recent importation the same bicycles appear on a cloth with design of flowers and fishes. The whole attraction in these examples, selected out of many patterns which I have inspected while preparing this monograph, lies in the representation of the bicycle, which is fast establishing itself as a 'common object of the sea-shore' in Madras.

The native scale of colour, except in so far as it has been perverted by a long course of imported colour-printed fabrics, to which natives have got accustomed, differs from the British colour-scale, as represented by dyers, and mainly in this, that the English colours tend to be crude, while the native colours are of more subdued or compound tints. For example, the beautiful vegetable reds of Madura and Conjeeveram are not what we should call a true red like the imported Turkey-red, but, as can be readily seen in some of the beautiful woven cloths in the industrial section of the Madras Museum, red with a slight admixture of blue.

Writing to me *à propos* of this monograph, one, whose authority in matters industrial I admit, says :— "Let me express a hope that you will not tread the track beaten by writers, who copy each other in abusing mineral dyes. Everything that was said against these dyes in the old days was true, but between the old days and the present day there is a vast difference. Most of the dyes we now import are alizarine not aniline. They

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are not crude in colour, and many of them are practically quite fast. The advance made in the manufacture of these dyes is equal to the advance made in chemistry or photography. You might as well abuse the platinotype and carbon print of to-day on the basis of what was said of the primitive daguerreotype, or the silver print which immediately followed it, as abuse the alizarine dyes of to-day on the basis of what was said against the anilines of twenty or thirty, or even ten years ago. Of course, as regards fabrics that may be classed as art fabrics, the use of mineral dyes is not to be encouraged, but I am thinking of the kapra (cloth) of the plebs, of which a hundred thousand yards are made to one yard of art fabrics."

I do not, for a moment, contend that the imported printed fabrics which form so conspicuous a feature of the female attire of the middle and lower classes of the native community, should possess the artistic merit, either in colour or design, of the lovely sáris manufactured at Adoni, Arni, Kampti, Madura, Tanjore and other places, or the beautiful satins of Ayyampet, of which fine examples are exhibited in the industrial section of the Madras Museum. But I unhesitatingly condemn both colour and design of many of the imported colour-printed fabrics, which, in a native throng, offend the eye when brought in contrast with the more subdued colouring of the woven cloths made by native weavers with country-dyed yarn, or imported yarn dyed with mineral dyes in Europe. And of these printed fabrics I submit samples taken at random from a large collection which has been examined by me, for the information of Government, as proof that my condemnation is not unjust.

Let me call into the witness-box hereditary weavers and dyers, and others, whose evidence, as being that of practical men and specialists, must carry weight.

Madura weaver.—The Madura weavers formerly used vegetable dyes of local manufacture far more extensively than at the present day, and Madura was famed for the preparation of a purely vegetable deep-red dye. The preparation of vegetable dyes is now limited to blue and black. The employment of vegetable dyes was abandoned, as it was found to be easier and cheaper to dye with imported mineral dyes, and cheaper to weave cloths with imported than with country-dyed yarn. The old vegetable dyes are superior to the mineral dyes, and, after repeated washings, cloths dyed with vegetable dyes keep their colour better, and last longer. The colour of cloths dyed with the Madura vegetable dye becomes actually brighter after washing instead of fading. The native population of Madura is attracted by the gaudy English printed fabrics, which are sold in the bazaar. For marriage ceremonies some castes will not wear imported fabrics.* Even now, in spite of the great influx of these fabrics, there is a large demand for locally-woven and dyed cloths. This is evident to anyone who takes a walk through the Madura bazaar towards sunset, and studies the dress of the native throng, in which locally-woven cloths with prevalence of yellow, and dyed or stained cloths with prevalent red, predominate to a marked degree.

Madura dyer.—Some years ago barrels of mineral dyes were sent to the Madura dyers by Bombay merchants as a speculation. Experiments were made with these dyes, with a view to ascertaining whether it was possible to obtain with them a colour resembling that produced with vegetable dyes, but at an appreciably cheaper cost. These experiments led to results which from the dyer and merchant's point of view were quite satisfactory. For the last eight or nine years the dyers have, for the production of the deep red colour, which constitutes a conspicuous feature of native dress at Madura, used a mineral moist colour of dark yellow colour, which they obtain from Bombay in casks. One result of the introduction of this mineral dye has been that the cultivation of various plants, which was formerly carried on solely for the sake of the dyers, has been abandoned. In the preparation of the dye a watery solution of leaves, called kayam kolli, is made, and the mineral colour added to it in a fixed proportion. These leaves are derived from a shrub, which grows wild at the foot of Alagar hill about twelve miles from Madura. Preparatory to dyeing, white yarn or fabric is treated with a mixture of gingelly oil and ashes of the indigo plant, called jum-jum, and obtained by setting fire to the plant, and sprinkling salt sand on it while it is ablaze. The yarn or fabric so treated is placed in a copper boiler containing the hybrid dye mixture, which is boiled until the colour has been absorbed to the required degree. The dyers know, as the result of experience, the correct proportion of yarn or cloth to a given quantity of solution. Different shades are obtained by successive re-boilings, *e.g.*, a pale pink cloth, which was shown to me, had been boiled twice, and a cloth of deep red hue five times.

The demand for Madura red cloths, dyed by the old process, in which only vegetable dye was used, is now very slight. But, when specially required on account of their more delicate shades, as compared with dyed

* "The great objection among Hindus to European long-cloth apart from its want of durability is that the coloured and embroidered border of the native cloth is wanting. So, on occasions of ceremony, the native cloth is still used. But, within the last year or two, cloths have been introduced into the market, exactly similar in appearance to the common country-bordered white cloth, and selling at two-thirds the price or less."—HAVELL. *Journal of Indian Art*, 1890.

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cloths turned out by the modern process, they can be made to order. Only those who possess a fine colour sense would order such cloths, as the modern product is such a close imitation of the older vegetable colour. An ordinary woman's cloth produced by the modern process costs only Rs. 1–8–0, whereas, if dyed by the genuine vegetable process, it would cost Rs. 2–8–0 or Rs. 3. Even for red cloths of the finest quality, including those interwoven with gold thread for the richer classes, the modern process is resorted to; and, sad to relate, the famous Madura vegetable red dye has practically ceased to exist. Its preparation is, it is true, still understood by existing dyers, old and young; but, unless some unforeseen reversion to abandoned methods occurs, future generations will arise, not only in Madura, but throughout Southern India, to whom the once justly admired vegetable dyes, and the fabrics dyed therewith, are but a hazy tradition of a bygone age. (The spurious imitation of the deep-red colour is certainly, as imitation, very successful, and bears testimony to the skill in technique of the self-taught dyers without recourse to State aid or technical school.)

Kumbakónam weaver—Is not so well off as his father, who was a weaver, and had not to contend against imported printed fabrics. The weaving industry has declined greatly, in recent years, owing to the importation of these fabrics. Now has only four looms at work instead of eight. Some weavers, who formerly owned looms, are now working as cooly weavers for daily wages. Cloths dyed with mineral dyes look bright and attractive when new, but fade. These dyes are, however, cheap and easy to work with, as no long process of preparation is necessary. Would be glad to see the imports of printed fabrics and mineral dyes abolished, as purchasers come and abuse the bazaar vendors because the colours fade, and some demand their money back on the ground that a bad article has been supplied to them. Madura weavers, who considerably outnumber the Kumbakónam weavers, send red cloths dyed with mineral dyes for sale at Kumbakónam. They are cheap, so natives naturally buy them. The merchants, who sell printed cloths, do not care about quality or good design, so long as they make a good profit. Merchants only buy such cloths as are likely to attract by brightness of colour, and command an extensive sale. Considers that the women of Kumbakónam do not look nearly so well-dressed now as they did before the introduction of imported printed fabrics and cloths dyed with mineral dyes. The price of the vegetable dye-stuff noonaver, which was formerly largely cultivated near Kumbakónam, has come down from Rs. 14 to Rs. 4 per maund, and even at this greatly reduced rate, it cannot be used, as its preparation takes several months. Thinks that Government should prohibit the import of printed fabrics and mineral dyes, or tax them very heavily, so that the indigenous industry may be protected. No action short of this will improve the prospects of the weavers. (The import of mineral dyes to Persia is, or was prohibited with a view to protecting the carpet industry against degeneration. And the importation of mineral dyes into Kashmir is, I am informed, subject, like that of indigo and other dyes, to the general rate of import duty, Rs. 6–10–3 per cent. which, added to our 5 per cent., is a pretty heavy load of taxation.)

Ayyampet weavers—Manufacture cotton, woollen and silk rugs. Vegetable dyes are used in the preparation of the yarn for the woollen and silk rugs, and Europe-dyed yarns for the cotton rugs. Imported dyed yarns look bright at first, but fade sooner than yarns dyed locally with vegetable dyes. The number of weavers is now very small as compared with former days, and there are only four weaving houses in Ayyampet. The industry has declined owing to the competition of jail-manufactured rugs, which have appreciably interfered with their means of earning a livelihood. They remember the days when the trade in Ayyampet carpets was brisk, when they always had a reserve stock in hand, and made carpets 30′×20′ or 20′×10′. (A cotton rug with parallel stripes of mineral red, yellow, and green, and indigo blue, and another with wide areas of red, blue, and white parallel stripes, interrupted by narrow areas with blue and white pattern, possessed no artistic merit, and were not nearly so good in colour and design as the woollen and silk rugs, which were brought to me for inspection.)

Bhavâni weavers—Manufacture cotton rugs on vertical and horizontal looms, of which the former have been recently introduced. Rugs woven on the vertical looms are the most expensive as they are thicker, and the texture is better than that of the rugs woven on the horizontal looms of ancient pattern. They, moreover, require more skilled labour in their manufacture. Ordinary rugs with red and black stripes cost Rs. 7 if made on a vertical loom, and Rs. 5–8–0 if made on a horizontal loom. For the warp, white yarn, spun at the Coimbatore Spinning Mills, and for the woof imported dyed yarns of various colours are used. Sometimes the weavers purchase yarn of local manufacture at the weekly market, and dye it black. Black yarn dyed locally, and imported red yarn, never lose their colour. All the other dyed yarns which they use lose their brilliancy after repeated washing. The rugs are sent to Madras and Trichinopoly, as well as to various places in the Coimbatore district, in which Bhavâni is situated. Some are sold to pilgrims, who come to carry out the bathing ceremonial at the confluence of the Bhavâni and Cauvery rivers. Otherwise there is not a great demand for the rugs, the manufacture of which is in a declining condition owing to lack of encouragement.

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Adoni weavers—Manufacture cotton rugs and carpets on horizontal looms. The weavers are Muhammadans. Used indigenous vegetable dyes until about fifteen years ago. The yarn is either dyed locally with imported mineral dyes, or purchased ready-dyed from Europe. The mineral dyes are durable and brighter than the vegetable colours. The greatest number of looms owned by a single individual is ten. They are not so well off as the last generation, as the number of loom-owners has increased, and the profits have consequently to be shared among a greater number of houses. They have, moreover, to compete against cheap imported carpets, and carpets of jail manufacture with patterns similar to those which they turn out. The carpets are sent for sale to Bombay, Calcutta, Madras, London and other places. Sometimes they receive large orders. The carpet merchants pay for the privilege of selling their goods on the railway platforms at Adoni, Gooty and Guntakal, where they do a good business with natives, who buy the rugs for bedding, and Europeans, who buy them for tent carpets, hold-alls, etc. The pattern of the majority of the rugs and carpets consists, as at Ayyampet, of parallel stripes of various colours. Carpets with diamond-shaped device and other more complicated patterns, which require skilled labour, are also manufactured. The carpets are absurdly cheap. One with parallel stripes, 8′×3′ 10″, is sold for Rs. 2–8–0. Such a carpet takes a man a working day of ten hours to make, and he is paid six annas. One with diamond pattern, 7′ 4″×4′, is sold for Rs. 3–4–0 and, after paying the weaver twelve annas and deducting the cost of the material, a profit of about two annas is left.

I learn from recent official records * that "acute distress has at the present time arisen among the weaving population of Adoni town. The circumstances of these weavers are peculiar, as they all work on a system of advances from money-lenders and cloth merchants, whose debtors they are. Owing to the sudden rise in grain prices all over India and the threatening state of the season, the cloth merchants and sowcars in Adoni, finding no market for woven cloths, have been obliged to stop all advances to the weavers who work for them, and the result is that the looms in the town, numbering over 4,000, have suddenly stopped working, and the weavers are without employment, and face to face with starvation." Steps have been taken for the relief of the weavers.

Kurnool weavers.—The following information is derived from recent official records † :—

Carpets are exported from Kurnool in very large quantities to Hyderabad, Berar, Nagpur, Agra, Cawnpore, Poona, Jubbulpore, Bombay, Khandesh, Gadak, Dharwar, Hubli, Bangalore, Mysore, Kampti, Madras, Cuddapah, Rajahmundry, and other places in Northern and Central India. At the present time the demand for them has altogether ceased owing to the severe distress that exists. The current prices of carpets in the local market barely cover the cost of the twist used, and leave absolutely no margin for even the cost of labour. Generally one bundle of carpets containing eight pieces was sold for Rs. 8, whereas each bundle does not now fetch more than Rs. 4 or Rs. 5 at the most; and, owing to this fall in prices, bundles of carpets worth about Rs. 20,000 are lying idle in the shops in the town. Besides the looms for carpet weaving, there are other looms in the town, where different kinds of cloths are woven. The looms afford occupation to Muhammadans, mostly gosha females, who cannot do any other work than weaving, and the closing of the looms means loss of occupation and livelihood to a very large number of weavers reported to be about four thousand.

A scheme for the relief of the weavers has been sanctioned, the carpets selected for manufacture being only such kinds as would find a ready local sale in ordinary times.

Samples of carpets (patti and chedasti) sent to me for inspection were less elaborate in design than those manufactured at Adoni, the pattern consisting of alternate stripes of blue and white, blue and red, or two shades of blue.

As bearing on the subject of native cotton carpet manufacture in the Madras Presidency, I reproduce the notes on cotton carpets of jail manufacture, with which I have been favoured by the Superintendents of the Salem, Tanjore, and Vellore Jails.

Salem Jail.—The manufacture of cotton carpets or jamkalams was first introduced in 1892. The industry was started on a small scale with one or two looms, and two or three patterns of plain striped carpets were woven. Through the exertions of the then Superintendent of the Jail, Mr. J. E. Young, carpets were sent round for inspection to friends and others with a view to orders for such work being canvassed. The demand being fair, and suggestions for improvement and development having been received, an outside professional was obtained. The number of looms was, at the same time, increased; new and varied patterns, both plain and flowered, were devised, and the industry showed marked signs of future development. Samples were sent to England, whence

* Proceedings, Board of Revenue, No. 317, dated 6th November 1896.

† Proceedings, Board of Revenue, Nos. 303, dated 31st October, and 323, dated 7th November 1896.

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orders for large numbers were received from English firms. At the same time the Commissariat Department was addressed, and orders for soldiers' carpets and bed-side rugs for hospitals were received and successfully complied with. The number of looms had to be still further increased to ensure punctual supplies to the Military Department.

The usual sizes of cotton carpets are 6′ × 3′ and 8′ × 5′. Carpets and rugs for the Military Department are generally 6′ × 3′ and 4′ × 2′. Tent carpets, ranging in size from 10′ to 14′ square, are also manufactured. The price of carpets of the ordinary pattern is Rs. 1–4–0 per square yard, rising to Rs. 2 per square yard according to workmanship, pattern, and quality.

The demand for carpets locally is fair, though to a certain extent natives—especially those who are unable to appreciate good shades and fast dyes—prefer the cheaper bazaar carpets. The monthly average sale of carpets for the past three years has been Rs. 163–14–10.

The principal colours, which are used, are blue, red, green, yellow, black, brown, káki and maroon. The vegetable ingredients from which the several dyes are obtained are usually as follows :—

Blue	Indigo.
Red	Logwood and lac.
Green	Turmeric and indigo.
Yellow	Turmeric and moorookamboo (flowers of *Butea frondosa*).
Black	Indigo and gall-nuts.
Maroon	Lac.

About twenty looms are now employed. New hands are instructed by convict overseers, who are specially selected from among men who have done thoroughly well in their work. At the same time, long-term convicts are trained, and the warder in charge of the workshop is sometimes capable of teaching the men in his charge.—(W. Molesworth, Superintendent.)

Tanjore Jail.—From 1890 a small beginning was made with cotton carpet-weaving of dyed twist obtained locally and from the dye-works, Bombay. The outturn was not much, but sufficient to meet the demands of the local hospitals. Gradually the demand increased; extra looms were erected; new patterns introduced; and a large quantity of English-dyed twist was consumed in the manufacture. The residents of the district in particular were large buyers, and, year after year, the demand has been increasing. Ten looms are daily in work, and about twenty convicts are employed on the manufacture. The carpets are made of different widths varying from 3′ to 12′, and are sold at Rs. 1–4–0 and Rs. 1–12–0 per square yard. Unlike the Vellore Jail carpets, those made in this jail are a little coarser. The patterns vary, and, as the natives of India proper prefer bright and gaudy patterns, a good deal of gold, green, yellow, orange, lemon, purple, blue and other colours are utilised in the carpets. With the exception of green, lemon, orange, chrome, and Turkey-red, which are purchased from merchants, and are made in Europe, all the colours are dyed in India with vegetable dyes. The weaving is very simple, and it never takes a convict more than a few months to learn the work. A convict overseer, who is himself a good workman, instructs beginners. Generally beginners are first put to coarse carpets made of 10's twist, white and coloured, and, after a few months' practice, to finer quality carpets, in which No. 20's twist is principally utilised, and, in the third and subsequent months, to the finest quality carpets. The carpets are woven on ordinary country looms.—(H. E. Upshon, Superintendent.)

Vellore Jail.—Cotton carpets have been manufactured since 1881. They consist of three varieties, termed ordinary, superior, and tent carpets. In the ordinary ones, the pattern is of a simple nature, usually consisting of stripes of various colours artistically arranged, while, in the superior ones, the texture is finer, and the design more elaborate. These carpets vary in size, but are usually made from 6′ to 7′ long and 3′ to 4′ broad. Tent carpets are plainer than the ordinary ones, and usually consist of stripes of two colours running at right angles to the warp. They are, of course, much larger than any of the other varieties, being made to fit the tents, for which they are intended. The usual sizes are 10′, 12′, and 14′ square. The ordinary carpets are priced at Rs. 1–8–0, and the superior ones at Rs. 2–4–0 per square yard, while the tent carpets are sold at Rs. 1–4–0 per square yard.

The supply is equal to the demand. People prefer purchasing in the jail, where they are sold at a higher rate being superior in quality to those sold in the local market. As the last-named variety is mainly used for tents, the demand is still greater.

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The dyes used in the manufacture of the cotton carpets are as follows :—

Blue	Indigo.
Brown	Catechu and logwood.
Green	Indigo and the flowers of *Erythrina indica*.
Yellow	Flowers of *Erythrina indica* and turmeric.
Light green	Sulphate of copper and lime-water.
Black	Sulphate of iron and gall-nuts.

The number of looms usually at work is ten. The looms employed are the ordinary pit-looms, the weaver sitting on a level with the ground with his feet in the pit. In cases where the carpet to be woven is a broad one, two, three, four, and sometimes five men have to sit abreast at the same loom. The weavers are instructed by the older hands and by the work overseers.

No share of the proceeds is, I am informed, credited to the convict weavers.

Conjeeveram weavers.—Mr. J. D. Rees writes as follows* :—"The town has for ages been the head-quarters of a large community of weavers, who have of late suffered grievously owing to the competition of Manchester goods. Coarse country cloths, however, are still manufactured. Weaving operations are, for the most part, carried on in the open air, either in the broad streets, or preferably under shady groves of tamarind trees, which abound in and about the town. As you enter a weaver's grove, it appears at first sight as if those occupied in this industry were engaged in a pretty game. Rows of women walk up and down the shady aisles, each holding aloft in the left hand a spindle, and in the right a bamboo wand, through a hook at the end of which the thread is passed. Alongside are split bamboos reaching as high as their hips, and, as they pass, they unwind the thread from the spindle by means of the wand, and pass it over each alternate upright. The threads, thus separated, are subsequently lifted with their bamboo uprights, from the ground, and, while extended from tree to tree in a horizontal position, are washed with rice-water, and carefully brushed. The threads are now ready to be made into cloth, and the actual weaving is carried on by means of primitive hand-looms inside the houses. In this manner are manufactured men and women's ordinary clothing, as well as the red handkerchiefs dear to the Tamil man, which he takes with him to Singapore, or any other distant place, to which he may migrate." (This account describes what may be seen going on in weaving centres throughout Southern India.)

Venkatagiri weavers.—Their specialty is a plain white muslin fabric with red or gold-lace bands for turbans and body-clothing for males. The thread, gold-lace and red dye-stuff are imported from Europe. They only make fine qualities of muslin at the order of rich people. The present generation is not so prosperous as the last. There is still some demand for the muslin at distant places, such as Madras, Salem, Trichinopoly and Kumbakónam. But the industry has declined owing to bazaar merchants selling imported mull, book-muslin, and colour-printed fabrics, which have the great advantage of cheapness. The people cannot at the present time afford to buy comparatively expensive clothing, as there has been a succession of years of scarcity with consequent high price of food-grains. They have had to increase the price of their muslin owing to rise in value of the imported thread and gold-lace.

Mr. Daday Khán, embroiderer, Madras City, has been in business about fifteen years. Learnt designing at his native school. Has gained prizes at various Exhibitions, Chicago, Indo-Colonial, etc. At Chicago there was a large demand for his work. Now has a considerable export business. His Indian business is almost entirely with Europeans, to whose requirements his manufactures are adapted. About fifty men are engaged in embroidery work at his shop, and, in addition, contract work is executed outside. Procures muslin from Arni, Cuddapah, Madura, and Dacca (Bengal). Considers Arni muslin of fine quality, made with country cotton, the best and strongest. Plenty of weavers are still engaged in the manufacture of coarse muslin, but the finer qualities now have to be made to order. The trade in the finer qualities has greatly declined owing to the extensive introduction of muslins made in Europe, and they are only manufactured by very few families as compared with former days. Sends the fine muslins to Calcutta to be washed, as, if washed in Madras, they become hard and stiff. Considers that, for his purpose, imported mineral dyes are better than indigenous vegetable dyes, mainly on the ground of the expense of, and time lost in, preparing the latter. Thoroughly understands the admixture of mineral dye powders so as to secure the requisite soft tints; and showed me a large number of samples of embroidered table cloths, table centres, mantel-piece borders, &c., which, in colour and design, were

* Twelfth Tour of Lord Connemara, 1890.

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certainly excellent. Beetles, for green beetle wing ornamentation, are mainly procured from the Cuddapah district. Makes coarse gold and silver lace himself, but obtains gold lace of fine quality from France, as he found manufacturing it more expensive than purchasing it from Europe. (The imports of gold thread to the ports of Madras in 1895 were valued at Rs. 16,60,533, and were obtained almost entirely from France.)

The following extracts from the catalogue of Madras Exhibits at the Indo-Colonial Exhibition, 1896, to which typical examples were sent, will indicate the nature of Mr. Daday Khán's work so far as cotton fabrics are concerned:—

	RS.	A.	P.
Ladies' dress in white net, embroidered in gold and beetle wings	75	0	0
Ladies' dress in black net, embroidered in gold and beetle wings	55	0	0
Ladies' dress in Arni muslin, embroidered in gold	70	0	0
Table cover in dark blue cloth, embroidered in gold and colours	18	0	0
Table cover in black cloth, embroidered in gold and colours	18	0	0
Table cover in red cotton, embroidered in white chain-stitch	2	8	0
Mantel border in black cloth, embroidered in gold and colours	15	0	0

Madras City (*Triplicane*) *weaver*—Has six hand-looms at work. The only indigenous dyes which he uses are indigo and surúl-pattai (*Ventilago Madaraspatana*). Re-dyes European red-dyed yarn with the latter to obtain a dull red tint. In former days used to make a good green with indigo, turmeric, and alum. Now mainly uses yarn dyed in Europe, with which weaving operations can be commenced at once, whereas the preparation of yarn dyed with indigenous vegetable dyes, will, in some cases, take six months. Does not use 'tinned dyes' as the colours do not last, and to employ them would be cheating his customers. The colour of cloths made with country-dyed yarn would last till the cloth was, by long wear and repeated washing, torn to rags. Makes body-cloths for Hindu and Muhammadan women. A plain cloth will take three days to weave, an average cloth five days, and an elaborate one twenty days. The weavers employed by him are paid by the cloth, not by daily wage. They work on old patterns as a rule, but exceptionally make special patterns to order.

Madras City (*Triplicane*) *weaver*—Uses dyes of various colours obtained by mixing tinned dyes with native dyes. Native dyes are more expensive than mineral dyes, and great loss of time is incurred in their preparation. Native dyes are fast, whereas mineral dyes fade. He first partially dyes the fabric with native dye, and completes the dyeing process with mineral dyes, which give brilliancy. If a school of dyeing was started in Madras, would come himself, and send his children to receive instruction there.

Madras City (*Saidápet*) *weaver*—Employs about a hundred weavers, who are paid by the job. Manufactures Muhammadan women's cloths (lungis), which he sells wholesale and retail to agents from Palghat, Calicut, Tellicherry, Tinnevelly, and other places. With the exception of indigo-dyed yarn, yarns dyed in Europe are used and have been for many years.

The colours used, among which various tints of red predominate, are for the most part subdued, and the patterns of the cloths plain and simple. Admits the superiority of seruver dye, but says that good seruver dye cannot be made with the river or well water available at Saidápet. The water of Washermanpet (in the city of Madras) and of Conjeeveram, where cloths are largely manufactured, is well adapted for the manufacture of this dye. Shown two samples of yarn, one dyed a reddish-brown in Europe, the other dyed red in Europe and re-dyed with surúl-pattai in Madras, distinguishes them by the fact that the latter is not so soft to the touch and of a dirtier hue, and by the difference in smell.

Madras City (*Saidápet*) *weaver*—Engaged in preparing cotton cloths with serinji and mineral dyes, which he purchases in barrels. Says that the results produced with mineral dyes are not so good as those produced with native dyes, but the dyeing process is cheaper, and the dyed cloths look very well when new. Would use native dyes from preference, if their cost was less. Sells the cloths to a godown-keeper, who returns cloths, which have faded while in stock to be re-dyed. If a school of dyeing was opened in Madras, would be glad to come and learn, if possible, how to work native dyes by cheaper processes than the existing ones.

Madras City (*Washermanpet*) *weaver*—Makes red cotton cloths, which he sells to merchants. Purchases European dyes in barrels. Dyeing with European dyes is a far quicker and cheaper process than dyeing with native dyes. The preparation of native dyes and dyeing yarn therewith may take many months. For some time there was no demand for cloths dyed with native dyes; but some demand is now arising, as it is found that cloths dyed with European dyes do not wear well, and the colour comes off the body when perspiring, and produces irritation of the skin. Shown some samples of mineral dyed cotton, manufactured by a firm in Germany, which has agents in Bombay, says that they would not go down in the Madras market as they are too bright. If

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Government started a school of dyeing in Madras, would be glad to go there himself and send his children to be trained there, if teaching was imparted how to use good coal-tar colours which are absolutely fast.

Before summing up the evidence here brought together as the result of examination of many witnesses at various dyeing and weaving centres, some account of the once celebrated printed cotton industry of Southern India and its present position is necessary. Technically, Indian cotton printed fabrics are (i) block-printed only, (ii) block-printed and hand-painted (or stained), (iii) hand-painted only. And I cannot do better than quote the words of Mr. Havell * based on his tour inspections of the industries of the Madras Presidency.

"The term palempore," he writes, "originally derived from the Hindustani 'palangposh' (a bed-cover) is now generally applied indiscriminately to all varieties of Indian printed or hand-painted cottons, including canopies, prayer-cloths or mats, handkerchiefs and cloths for male and female wear. Indian cotton manufactures, and probably also printed cottons, have been known since time immemorial though the original home of the latter industry seems to have been in Persia.

"The industry may be divided into two branches, the first including handkerchiefs and turbans, cloths for males and females (dhutis and sáris), bed-covers, canopies and prayer-cloths—all, with the exception of the last, being for strictly domestic use. The second embraces cloths of special manufacture, nearly always hand-painted, used as canopies over the images of Hindu gods, and at marriage or other ceremonies. They are also used to drape the car of the god in sacred processions. The different varieties in the first class of manufacture are used nearly exclusively by Muhammadans, though in the South of India the Muhammadans have assimilated many of the customs and habits of the Hindu, and the second kind, of course, is made for Hindus only. In the Madras Presidency, Masulipatam in the Kistna district, Palakollu, Gollapallem near Cocanada in the Gódávari district, Nagore and Kumbakónam in the Tanjore district, and Permagudi and Pámban in the Madura district are the chief places where the former kinds are made, while, for the other variety, Kálahasti in the North Arcot district, Salem, Palakollu, and Masulipatam are noted. The colours used in the printing are, in all cases, the same, though the whole of them are not always in use in one place.

"The palempores of Masulipatam have a wide fame. The kind usually seen at exhibitions are large cloths used as screens or canopies printed by hand, with conventional representations of trees (the Persian tree of life) covered with flowers, parrots, peacocks, and other birds perched or flying among the branches. At the foot a river is sometimes flowing, or tigers and other wild beasts prowl round underneath the shade of the tree. But this is by no means the usual kind made. In fact, there are only three families existing now, who are capable of preparing them, and they are only made to order. On account of the tedious process of repeated boilings which the red colour requires, two months are required for the preparation of each cloth. The ordinary trade is in block-printed canopies, screens, and bed-covers, women's and men's cloths, and in the varieties which I have before classed as the first branch of the industry. Of these, the canopies and bed-covers are best known to Europeans; but many charming specimens of handkerchiefs, cloths, and prayer mats, which are seldom seen except by those who go to the bazaars and purchase for themselves, are also made. The commoner cloths, with the patterns stamped only in red and black, show off the outline of the patterns to the most advantage; but the cloths which have partly coloured grounds generally please most by the delightful sparkle and brilliancy of the arrangement of colours, an effect for which the hand process is admirably adapted. The precision of outline is often lost, and the corners are often carelessly printed; but there can be little cause to wonder at these defects, when one considers the amount of hand labour involved (in the waxing required before the application of the blue) in picking out elaborate patterns spread over five or six yards of cloth; and the whole result as representing perhaps two or three rupees, including the cost of the cloth. The original impressions of the block are by no means coarse or unfinished, as can be seen by reference to cloths with a white ground, to which the blue has not been applied. The blocks themselves are generally beautifully cut and finished with great minuteness and care.

"A distinct variety of palempores belonging to what I call the first class is made at Permagudi and Pámban. They are chiefly handkerchiefs and men's cloths for export to Burma, the Straits, and Arabian ports, and are noteworthy as being entirely hand-painted. The instrument, however, is somewhat finer than that used at other places, and the patterns are very delicate, having the appearance of embroidery. This is especially the case in an unfinished cloth with the first preparation of wax before it is soaked in the dye. The patterns are drawn directly on the cloths with the somewhat primitive apparatus described above, without the slightest hesitation or preparation, beyond a few lines roughly traced in charcoal to mark the divisions of the pattern.

* *Journal of Indian Art.*

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The red dye is remarkably deep and permanent, the Madura district being famous for the preparation of this particular colour. Similar cloths, but bolder and somewhat coarser in design, are made at Nagore and Kumbakónam, and at Karuppur in the Trichinopoly district. Block-printed palempores are also made at the first two places, but are only remarkable for their inferiority. Other places, in which block-printed palempores of the first variety are made, are Palakollu, Walajanagar in the North Arcot district, and Gollapallem near Cocanada, but their productions have no special merit or local character. At Saidápet, a suburb of Madras, block-printed cloths, with patterns of the same type as the tree of life described above, are made, and much good work may be found in some of them. The place best known for the second variety, or sacred palempores, is Kálahasti in the North Arcot district. Their best qualities are found in the rich and harmonious effects, which, at a suitable distance, the fine deep tones of the red, blue and yellow, present in contrast with the narrow strips of white ground on which the inscriptions are placed. The scenes represented are generally taken from the Hindu epics, the Máhabarata and Rámayana, the inscriptions being quotations from the same works. Far superior to these in drawing and graphic composition of the figures, and not less remarkable for colour are those made at Pallakollu in the Gódávari district. They are generally on a white ground, and additional interest is given to the composition by the conventional landscapes, and by the palm trees and flowers serving as divisions to the groups of figures which illustrate the different incidents of the story. Only one man and his family occasionally make these to order. Other patterns made by the same man are of the tree of life type, the effect being somewhat heightened with gold-leaf. These sacred palempores are also made to a limited extent at Masulipatam and at Salem, but in design there is nothing special to note with regard to them. Those of Salem are inferior in execution. The best productions of the latter place are in a variety of palempores generally used as canopies in religious processions. They are entirely hand-painted, and are generally good in design, colour, and execution; but the outturn by the two families who make them is so limited that it is not easy to procure good specimens. In design they are quite distinct from the palempores of any other place in the Madras Presidency."

A magnificent collection of block-printed and hand-painted palempores, such as will probably never again be brought together, was exhibited in the Madras section of the Indo-Colonial Exhibition, 1886. Of these, many were no doubt bought up, at the close of the exhibition, by the agents of British firms. A select number were, however, returned to Madras, and now form a conspicuous wall decoration in the art gallery of the Madras Museum. The most noticeable specimens in this unique collection were—

1. A palempore of Persian carpet pattern, exported largely to Persia, 18′ × 18′. Manufactured at Masulipatam, Rs. 60.

2. Canopy cloth with scenes from the Máhabharata, 6′×6′. Manufactured at Kálahasti, Rs. 12.

3. Canopy cloth with scenes from the Rámayana, 13′×11′. Manufactured at Kálahasti, Rs. 35.

4. Palempore with big lotus-flower pattern, in which the central design of a flower with fully expanded corolla calls to mind the lotus discs, which are so prominent a feature of the sculptures from the Amarávati stupa in the Kistna district. These sculptures, set up in the archæological section of the Madras Museum, should be, it may be noted *en passant*, but are not used as patterns for design in wood-carving or metal-ware, by those concerned in maintaining design at a high standard of excellence in Madras.

5. Palempores with bird and flower design, profusely decorated with gold-leaf. Manufactured at Pallakollu, Rs. 300; Rs. 183.

6. Five so-called palempores from Manchester, imported for sale in Madras and Bengal, and exhibited to show the great deterioration of the pattern.

As a striking contrast to the Kálahasti canopy cloths, the Madras Museum possesses a cloth of similar type, with scenes from the Rámayana (manufactured, I believe, at Tadpatri), in which the artistic effect is ruined by the liberal use of hideous violet and green aniline dyes, which stand out in bad contrast with the indigenous red and blue vegetable dyes.

In the course of one of his industrial tours in the North Arcot district, Mr. Havell found at Walajanagar and Arcot, in nearly every house where block-printing was carried on, old blocks of very elaborate and beautiful designs, many of them of Persian origin, piled up in corners or in the roof, covered with dust, or, in some cases, cut in pieces and utilized for the patterns now in use, which are very poor and altogether inferior to the old ones. Of these splendid blocks Mr. Havell managed to secure some two hundred, which, with others, now occupy an honoured place in the industrial section of the Madras Museum. Many of the single block patterns are reproduced in plates I to XVI with a view to attracting attention to their merit, and as an object lesson to those responsible for the degenerated patterns of printed piece-goods.

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In the course of a conversation with a piece-goods merchant from the Madras bazaar, as a means of enforcing on him the wickedness of his samples of women's cloths of local or British manufacture, with crudely-executed design, and printed with red, yellow and green mineral dyes, I invited his attention to a series of prints of the Arcot blocks. The excellence of these he readily admitted, and he showed good taste in the selection of those which he considered to be good patterns. So much impressed was he, that he willingly took away a collection of prints from the best blocks with a view to having copies of them made in colours by his moochee.

At Ayyampet in the Tanjore district, block-printing in several colours has, of late years, been abandoned, and new blocks have actually been made in mimetic imitation of the design on imported British cloths with debased Persian pattern in black on a white ground, which are used as shawls by males. And the old wooden blocks and ingeniously constructed brass blocks are set aside as rubbish, buried amid dust and cob-webs.

The Rája of Kálahasti has in his possession a magnificent mythological hand-painted palempore, which is used on State occasions, and cost many hundreds of rupees. The Kálahasti cotton fabric painters, whom I recently interviewed, were at first afraid of me, suspecting that I was a commercial traveller on behalf of some firm, and had come among them with the base object of annexing their patterns for reproduction by machinery in Europe. They complained bitterly that British manufacturers are now copying patterns, which they and the Masulipatam block printers had turned out for many generations, and drew my attention to an imported cloth with debased Indian pink (*Dianthus*) device. A piece with similar device made at Kálahasti with vegetable dyes used to cost four rupees, whereas the British imitation, being machine-made with mineral dyes, can be sold at two rupees per piece. For shawls and handkerchiefs, block-printed in a single colour, they now resort to mineral dyes on account of their cheapness and easy preparation. For the hand-painted palempores and dados with mythological scenes from the Rámayana and Máhabharatha, lotus and goose (hansa), or tree of life pattern, vegetable colours (indigo, seruver, manjisht, &c.) are still used with fine colour effect. The hand-painted canopy cloths are purchased more especially at the time of religious festivals, which take place periodically at Kálahasti; but the demand for them has greatly declined in recent years owing to the importation of British printed cloths, which are used as a cheap substitute for them. A cloth, which could formerly be disposed of for thirty to thirty-five rupees, has now to be sold for eight to ten rupees, and the workmen, who are very skilful artisans, cannot even earn four annas a day. The painting of a mythological cloth 15′×7′, costing twelve rupees, will take a month, and a very small margin of profit is left.

I feel convinced that, were the Kálahasti palempores brought more prominently to notice than is possible when they are buried away in the bazaars of Kálahasti, which is far removed from the track beaten by Europeans, who would be ready to purchase them at a price somewhat greater than the very modest one which is now current, a distinct impetus might be given to the industry, and the condition of the artisans improved.

The Government of India recently commended to the attention of the Government of Madras the resolution of the Lahore Art Conference, 1894, to the effect that "in all places at which there are distinct local industries, small museums or more correctly show-rooms should be established, in which type-collections, illustrative of those industries, should be placed and kept up. That they should be under the supervision of the local authorities, but be inspected periodically by the Superintendent of the provincial museum, without whose approval no objects should be kept permanently as types." My personal opinion in connection with this resolution is that no museum or show-room, however small, can flourish under amateur management, even if subject to the general control of a professional museum expert with power to make inspections, which must, of necessity, be few and far between. Moreover, the organisation of small local museums is no new idea so far as the Madras Presidency is concerned, but a scheme which has been put to the test and failed conspicuously. But I have often wondered that the Tanjore metal-workers, Trichinopoly pith-modellers, Kálahasti and Masulipatam palempore-makers, Ayyampet carpet weavers and others do not, as is done in some of the big cities of Northern India and by the Adoni carpet-weavers, sell their wares, by arrangement with the railway companies, at the big railway stations, more especially in the cool season, when the itinerant 'globe-trotter' is *en evidence*. The establishment of stalls on railway platforms, under some organised arrangement by which only the sale of recognised merit was permitted, would, it appears to me, be more practical and effective than museums or show-rooms, which might easily escape the attention of those for whom they are intended.

In his address to the Lahore Art Conference, Surgeon-Lieutenant-Colonel T. H. Hendley spoke as follows:—"It is for us, gentlemen, to ascertain whether it is possible to try to teach both purchasers and producers to differentiate the good from the bad, and, if we cannot directly guide the dealers, at all events to see that our art schools and our museums only supply and purchase the best examples, and do all they can to discourage the sale of indifferent ones." These remarks, made with reference to the commercial aspect which

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Indian art has assumed, apply with equal force to the fast waning native cotton fabric industry of the Madras Presidency, both in its art and in its economic aspect.

Sufficient evidence has, I think, been brought together to prove that there is a marked deterioration and decline in the native dyeing and weaving industries, for which two primary factors are mainly responsible, viz., the importation of aniline and alizarine dyes, and of piece-goods, more especially cheap colour-printed fabrics.

The Lahore Art Conference summed up its views on the subject of mineral dyes in a resolution to the effect that "the conference are of opinion that a serious danger threatens the Indian tinctorial industries through the rapidly increasing consumption of aniline dyes. It is felt that to check this evil involves many financial and political considerations, but that something might nevertheless be accomplished by Government in the desired direction. Some action might be taken, through the medium of local bodies, to show to dyers and others in what respect aniline dyes are harmful. It might also be desirable to issue a regulation prohibiting the introduction of carpets, calicoes, &c., into museums or exhibitions if coloured with these dyes. It is understood that they serve a certain useful purpose as cheap temporary dyes; otherwise the conference would have preferred to recommend to the Government of India to totally prohibit their introduction into India."

Attacking the question of mineral dyes from a different stand-point, a Committee, appointed by Government in 1895 to enquire into the re-organisation of the Madras School of Arts and Industries, with myself as its secretary, summed up the results of its deliberations in connection with the dyeing of textile fabrics in the following terms :—"The committee believe from the evidence before them that there is a distinct field for the establishment, in connection with the School of Arts and Industries, of a school of dyeing, printing and weaving, according to the most advanced knowledge of the time, and adapted for both employers and operatives. They believe further that the establishment of such a school might, by attracting the attention of capitalists, help to check the importation of cheap and vulgar European manufactures with debased Indian design. There appears to be every reason to believe that the classes would be largely attended from the commencement both by native dyers and their sons, and by Europeans, and it is within the knowledge of the committee that one firm would send at least ten Europeans to receive instruction at the school. It would be necessary that the school should be completely equipped with dye-houses, chemical laboratory, &c., and that the staff should include a European dyeing expert to teach the theory and practice of dyeing. . . . . During the five years 1890 to 1895, 3,192,304 lb. of aniline and alizarine dyes were imported into the Madras Presidency. These dyes are, in fact, so firmly established in the Indian market that no measure short of a prohibitive import duty can arrest their employment. It seems to the committee that, even allowing that these dyes are to be utterly condemned from an æsthetic point of view, distinct practical good would result from educating the hitherto self-taught native dyers in the proper way of selecting and manipulating them, neither of which points they at present, from want of special training, understand. Quite apart, however, from the teaching of improved methods of dyeing with artificial dyes, one object of the school should be to try and improve the at present laborious process of manufacture of the indigenous vegetable dyes, for it is universally admitted by the native dyers that they only use the artificial dyes, because they are cheap and quick in operation."

In a letter to a member of a Madras firm engaged in dyeing operations with mineral dyes, Professor Hummel, of the Leeds School of Dyeing, wrote to the following effect :—"I am much obliged for your offer of Indian dye-stuffs, but we are now able to obtain all we want from the Imperial Institute, and we are now engaged in making experiments with all that seem worth examining. I am not a believer in the superior excellency of Indian dye-stuffs. *Properly selected* coal-tar colours are far better in every way." The recent experiments of Professor Hummel and Mr. Perkin* in connection with ál or noona (*morinda*) dye may be referred to as an example of the discovery, by laboratory research, of an improved system of using a dye principle as compared with the more clumsy system in vogue among the self-trained native dyers. And the practical value of these experiments affords an argument in favour of the establishment of a School of Dyeing in Madras.

Possibly long familiarity with, and study of Indian vegetable colours, and a tendency to regard them through Indian spectacles, may be responsible for biassing me in their favour, but I join issue with those who consider them, from a purely colour point of view, as inferior to coal-tar dyes. At the same time I fully appreciate the various advantages, of cheapness, quick outturn, &c., which accrue from the use of aniline and alizarine dyes, and the impossibility of eradicating them, now that they are firmly established in the great Indian market. With the native women's cloths, woven with yarns dyed in Europe with aniline and alizarine colours, there is really

* *Vide Agricultural Ledger*, Calcutta, No. 9, 1895, Ál dye (*Morinda*).

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but little fault to find. The original patterns are still adhered to, and the blending of the colours is often skilfully carried out by those native weavers who use judiciously-selected imported yarns. But I protest emphatically against many of the colours used in the manufacture of woven and printed fabrics by native artisans, who use badly-selected dyes, which they purchase in tins or barrels. And I maintain that some action should be taken to improve both design and colour of many of the imported colour-printed fabrics, which one can only wonder that any civilised individual is willing to place on the market. If no action is taken in the immediate future, it is, as Mr. Havell writes,* "obvious that, in no very short time, the whole of the native industry in the low-caste or purely cotton cloths must give way, and only a remnant of the finer manufacture, in which silk is partially or wholly used, will be able to hold its own to any extent against the cheaper, though vastly inferior, in every way, European goods."

Admitting the hopelessness of any attempt to entirely arrest the importation of these goods, it nevertheless seems to me that the Madras Government School of Arts might, with a change of policy, prove a great influence for good, and that it should take an active lead in a serious effort to bring about an improvement in the colour and design of imported printed fabrics, and an amelioration of the condition of the native weavers and dyers, who, as hereditary artisans, are worthy of our sympathy and support. State interference with existing trade concerns is, I am fully aware, not wholly unattended with difficulties, to overcome which would require very careful steering by one gifted with tact, and able to win the confidence of the commercial community (European and Native) interested in the piece-goods trade. Ample material is available as a guide to the production of suitable design and colour in their relation to cotton fabrics for native wear; and an earnest effort should, it seems to me, be made by the School of Arts and Industries to check at least the production of the most glaring barbarisms in colour-printed fabrics, by the preparation and wide-spread distribution of patterns, carefully selected as regards colour and design, with a view to guiding both the designers and the manufacturers into a better path.

* *Journal of Indian Art*, 1890.

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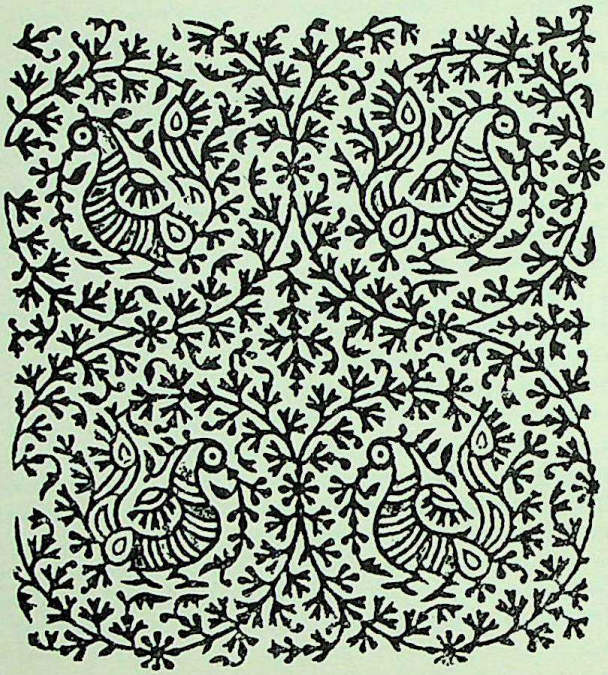
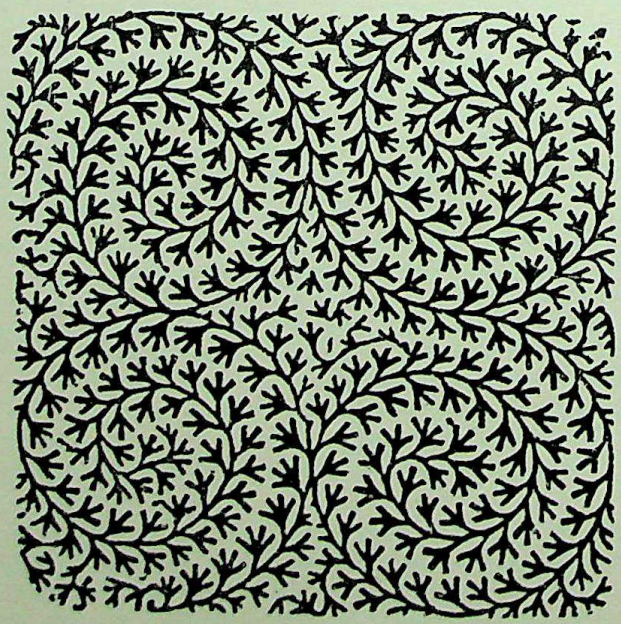
Plate I—Arcot Wood Blocks.





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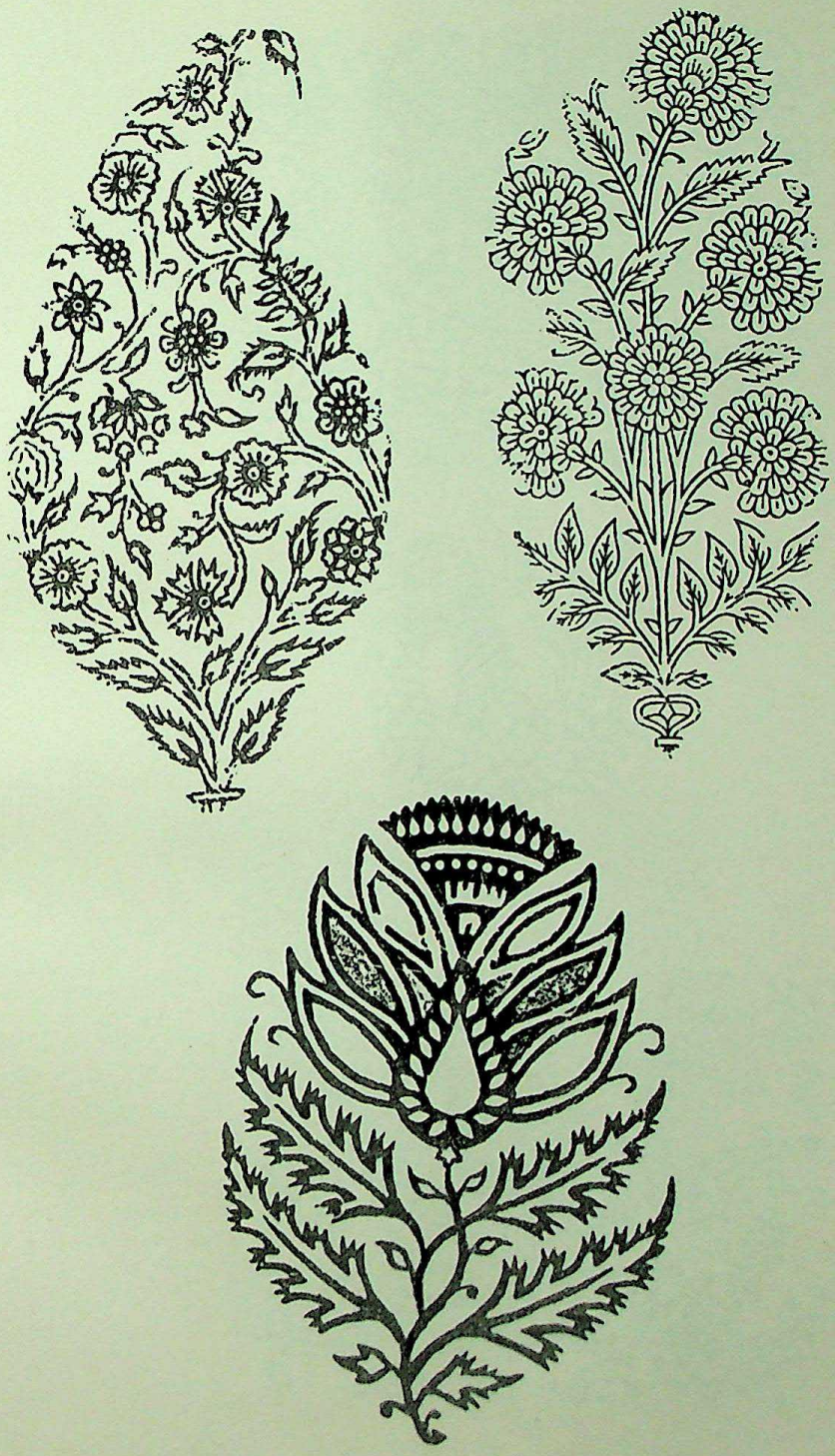

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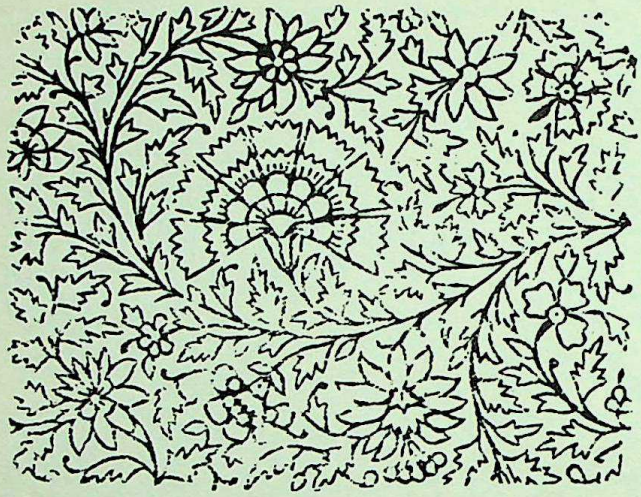

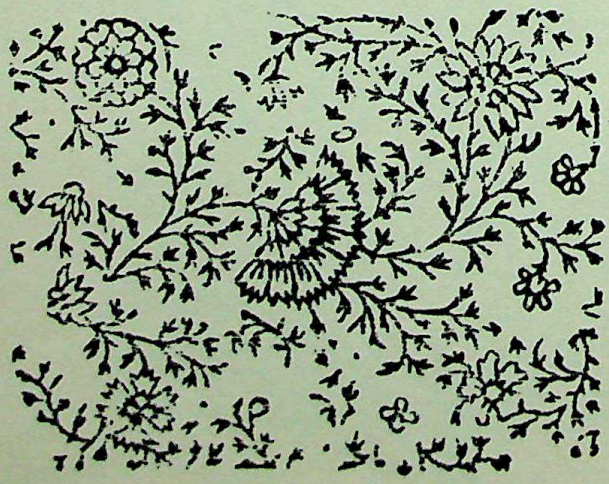

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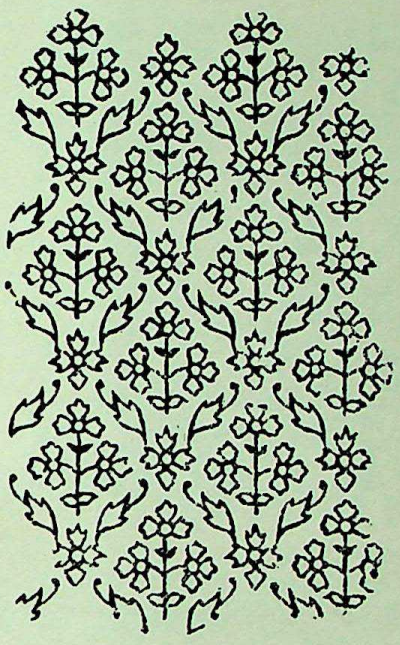

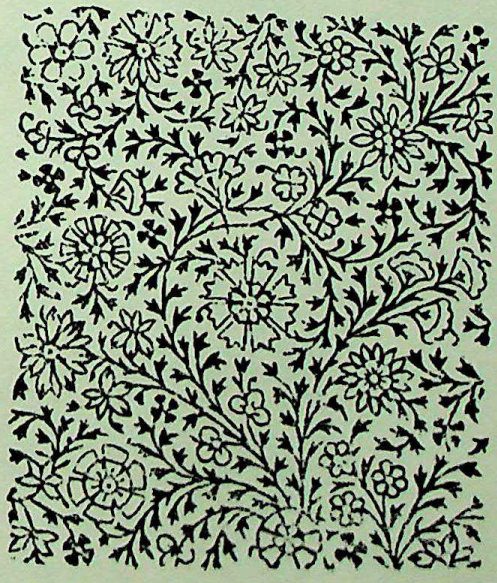

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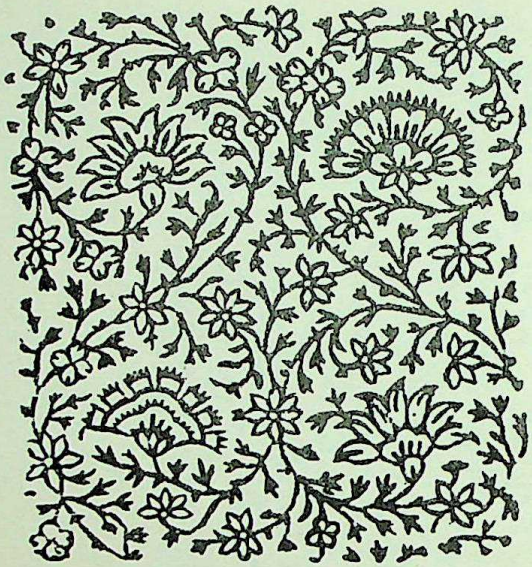

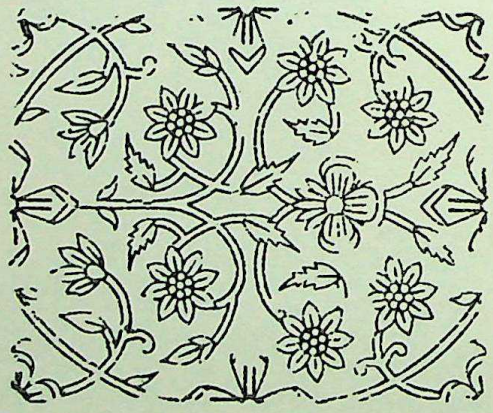

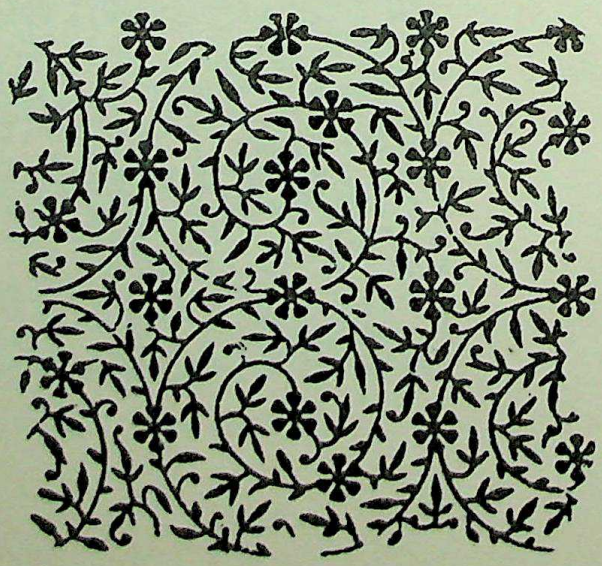

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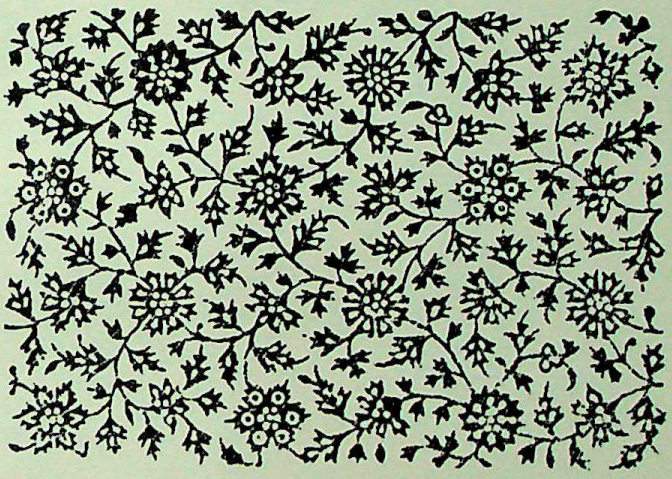

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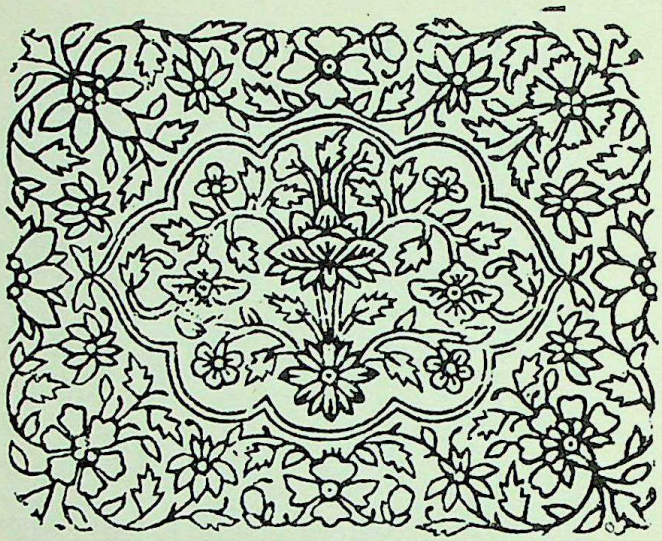

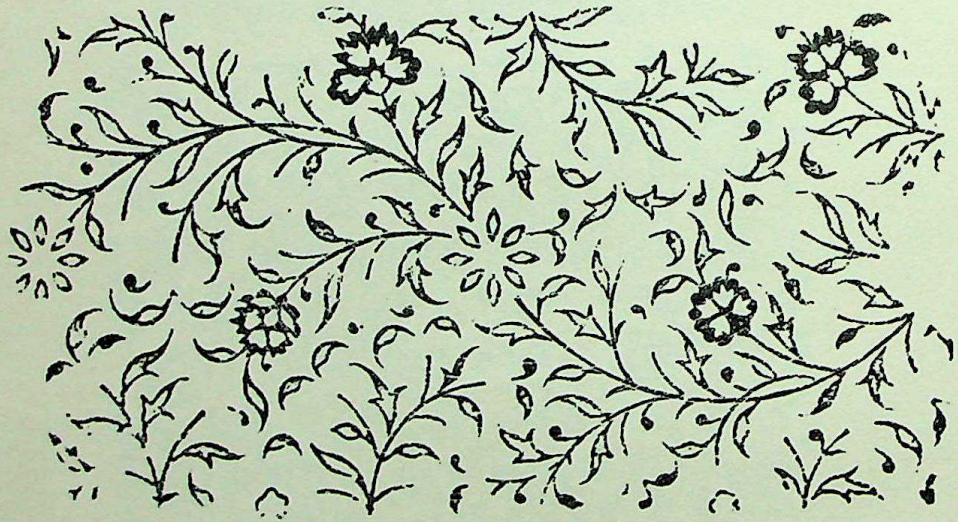

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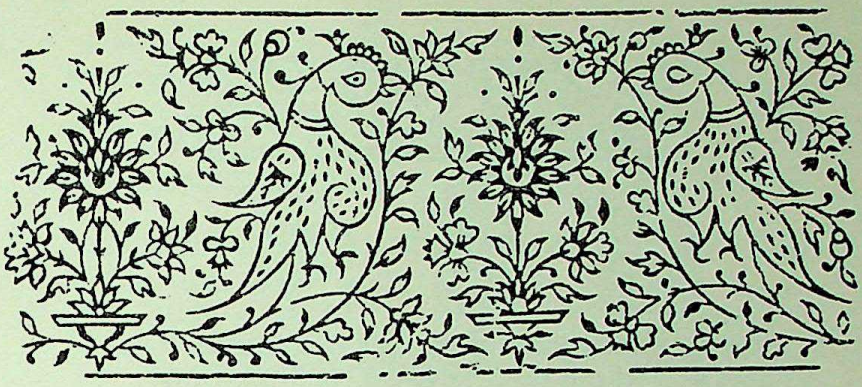

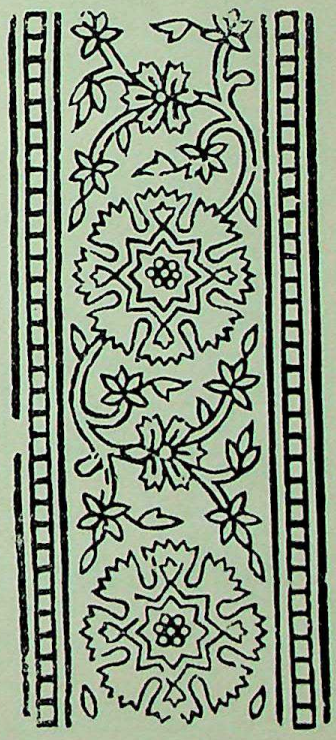

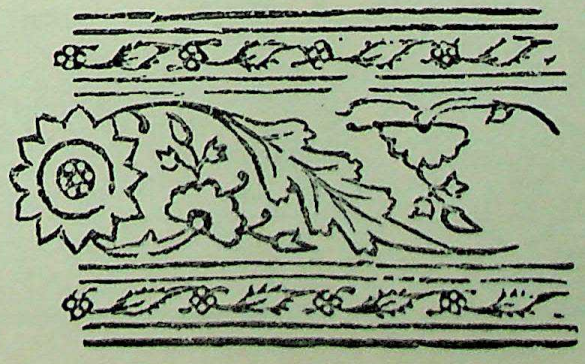

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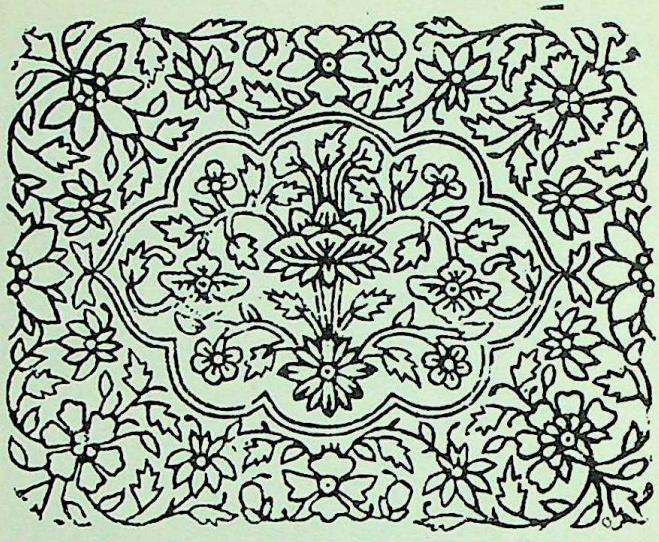

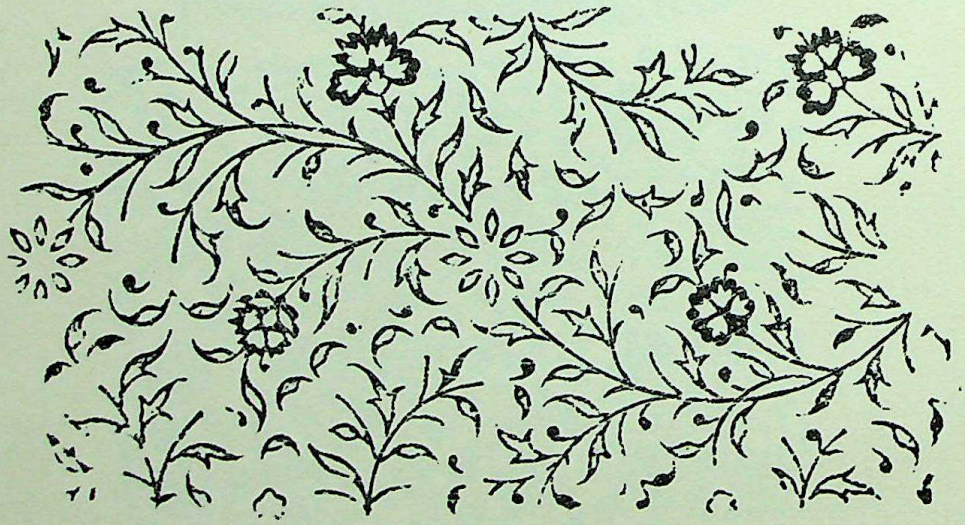

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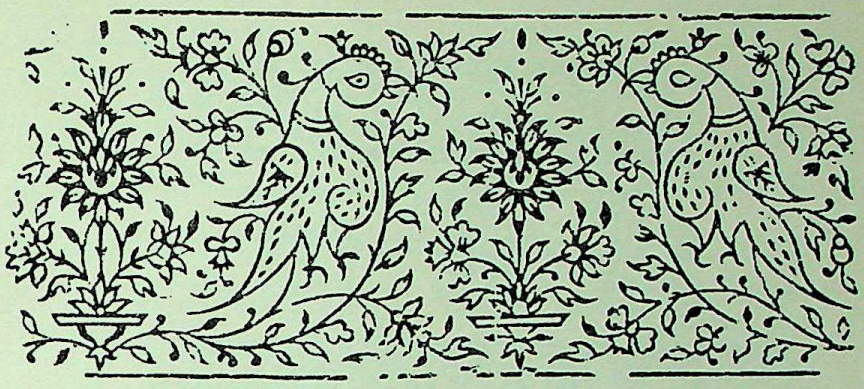

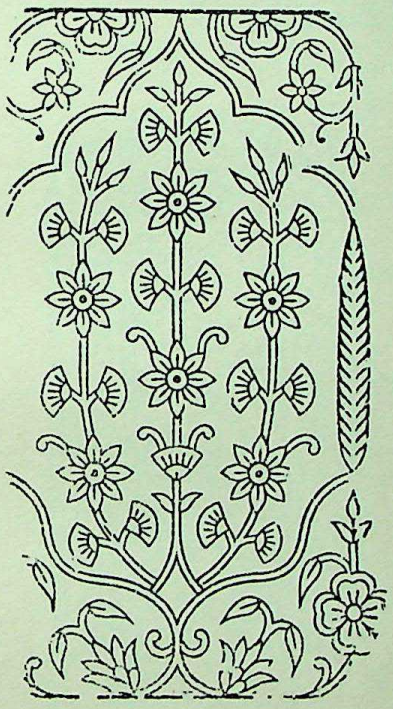

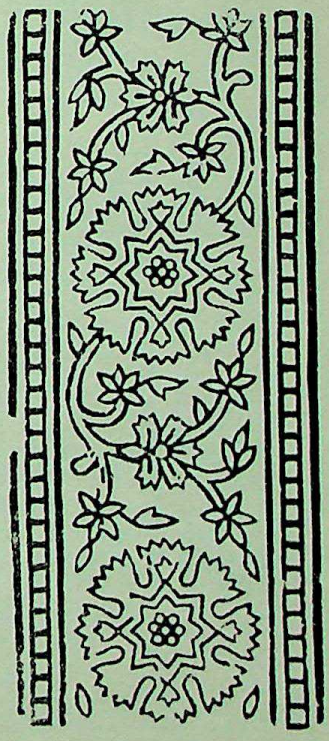

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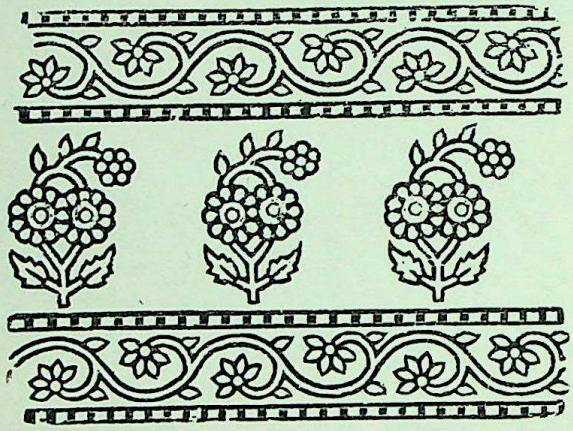

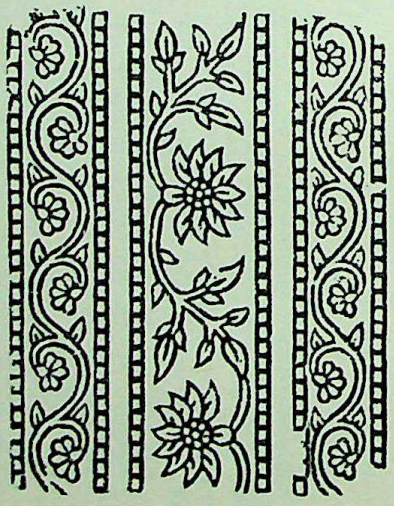

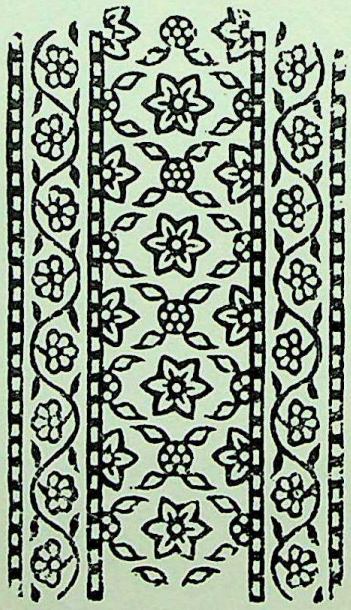

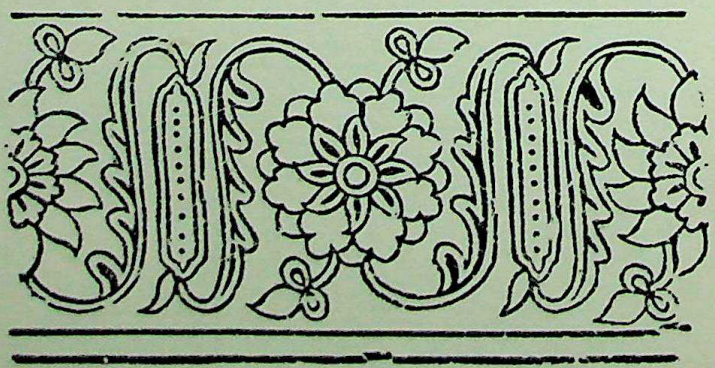

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Plate X—Arcot Wood Blocks.

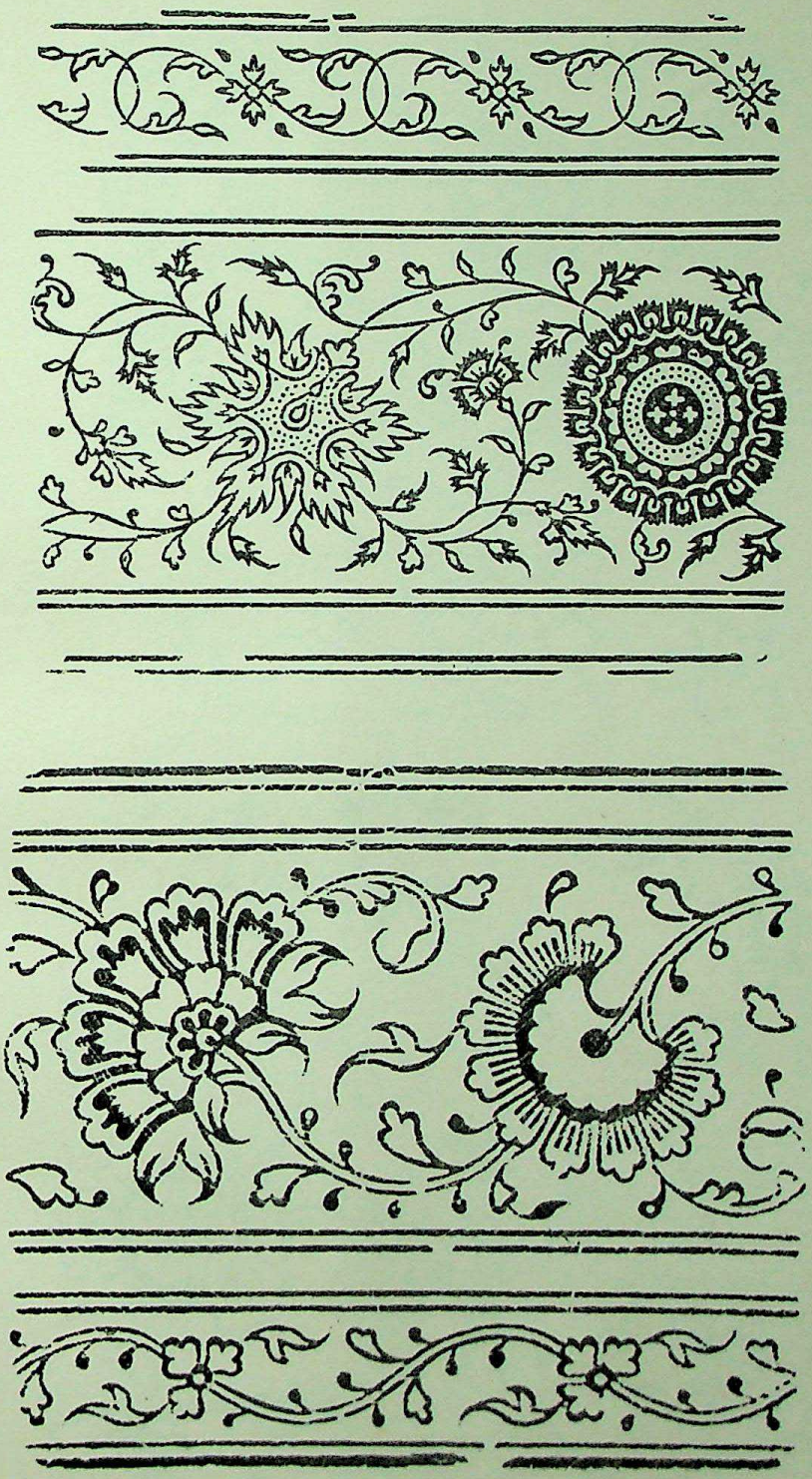

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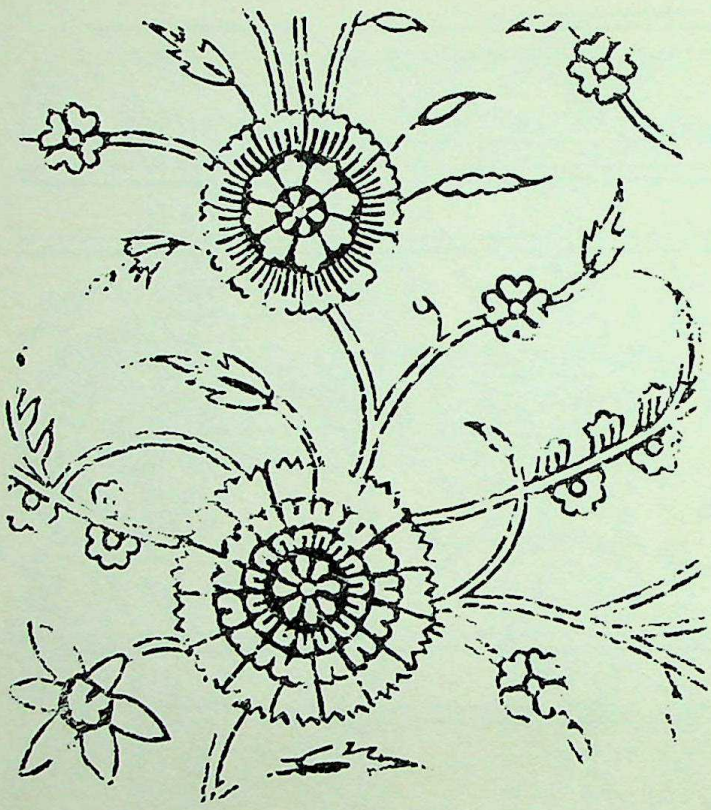
Plate XI—Arcot Wood Blocks.



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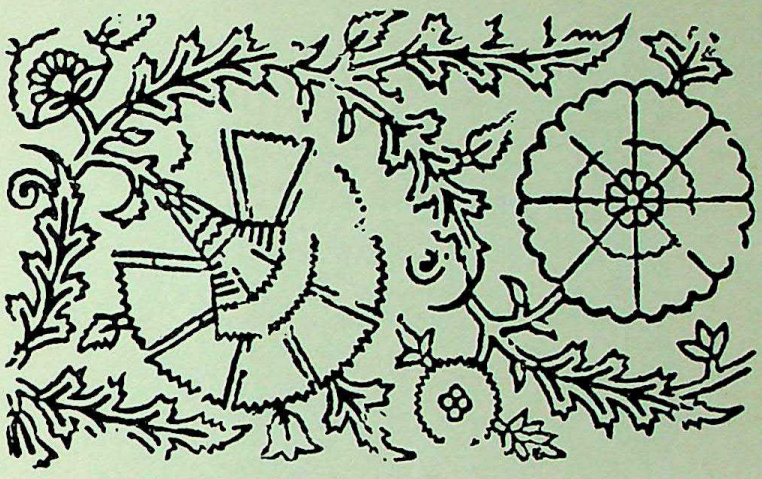

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Plate XI—Arcot Wood Blocks.

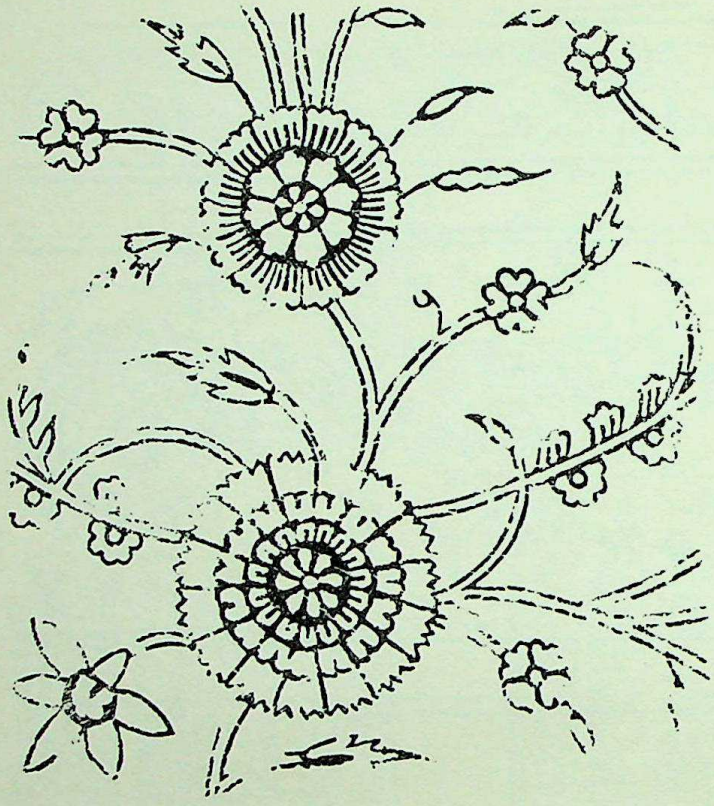

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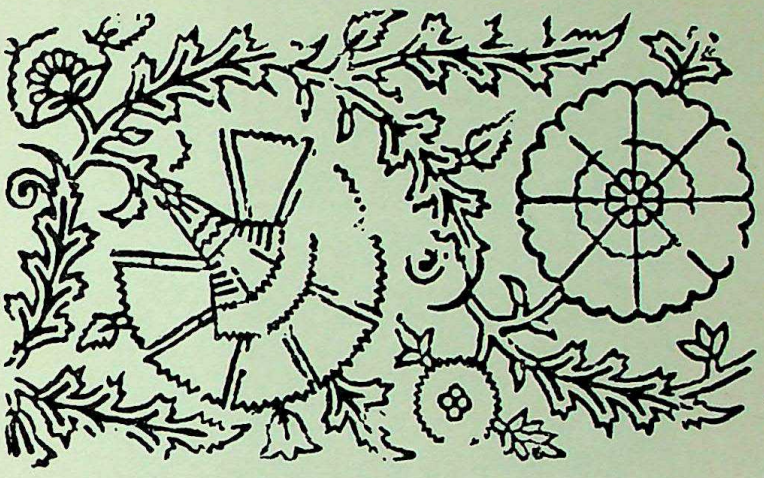
Plate XII—Arcot Wood Blocks.



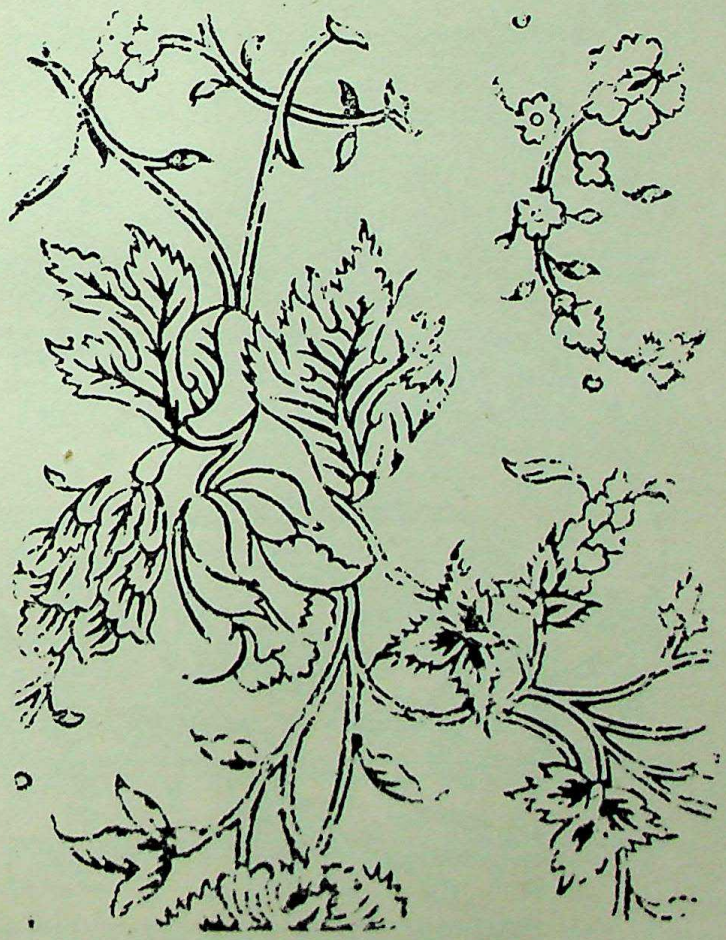


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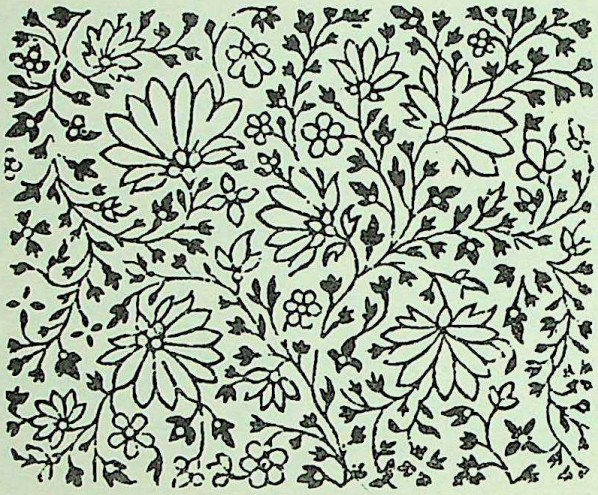
Plate XIII—Arcot Wood Blocks.



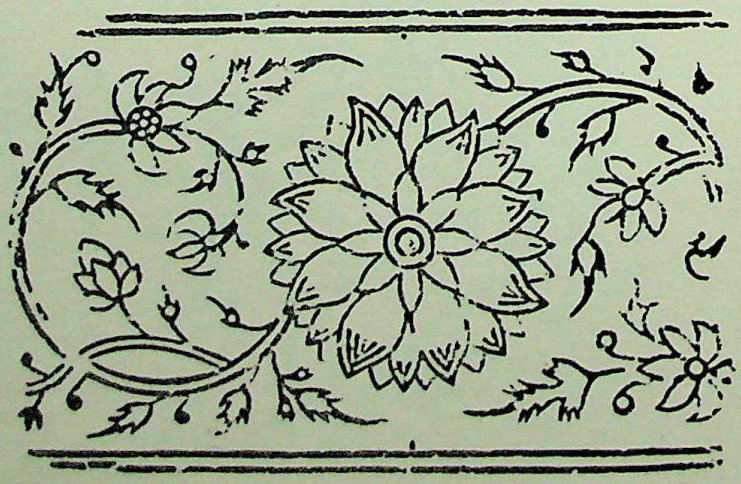


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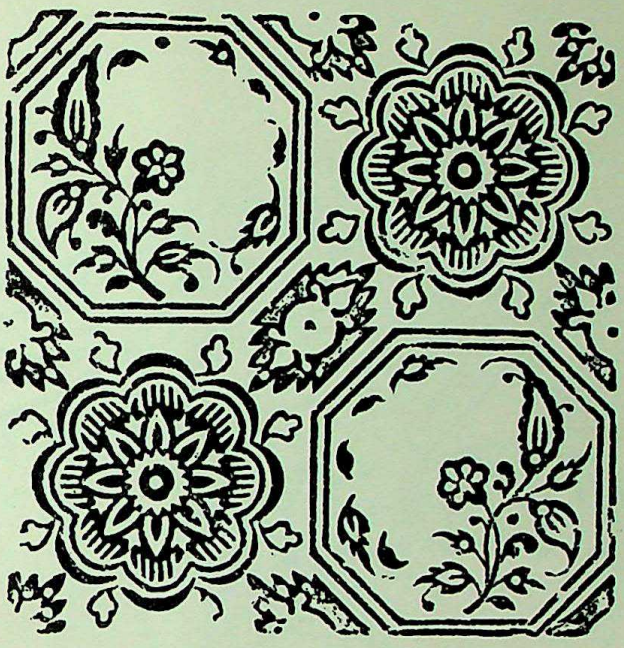
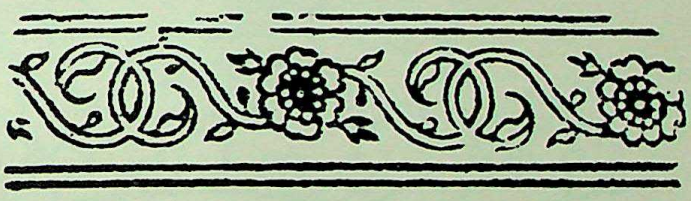
Plate XIV—Arcot Wood Blocks.





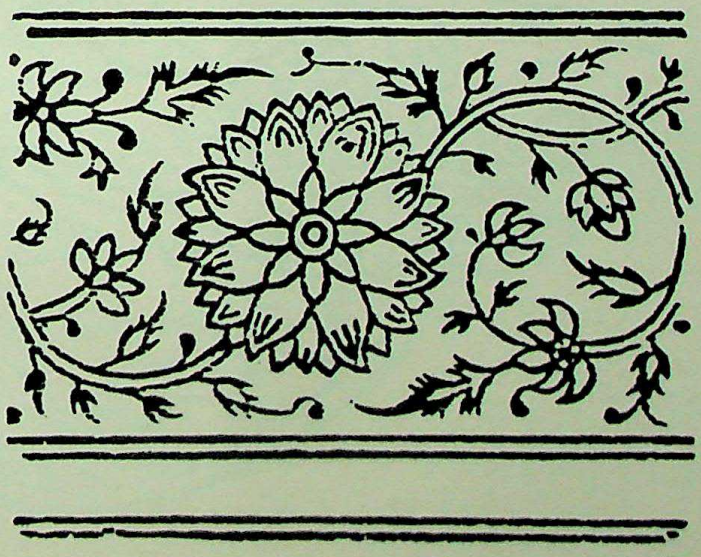


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Plate XV—Arcot Wood Blocks.

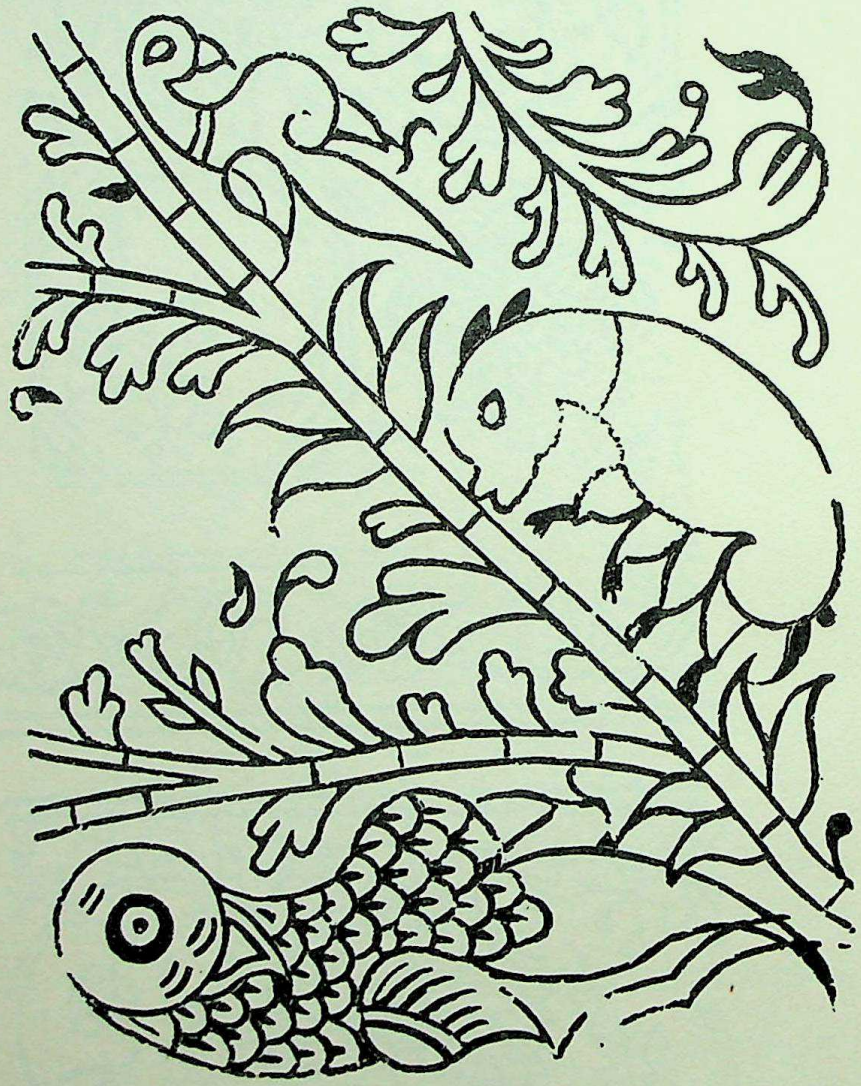

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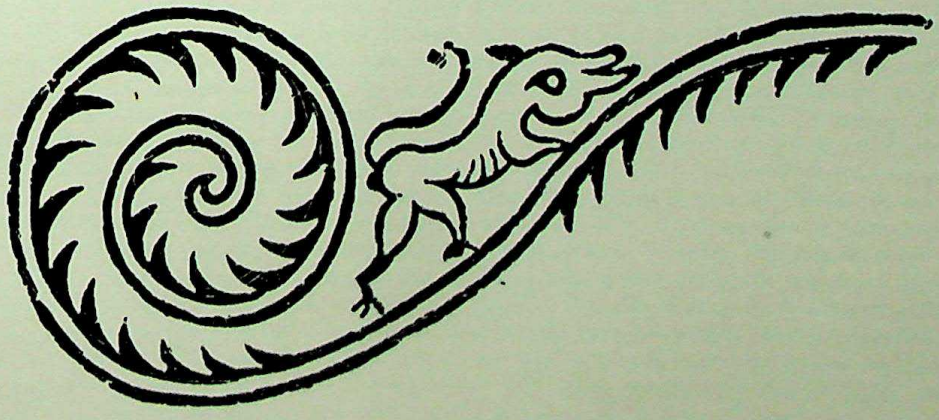
Plate XVI—Arcot Wood Blocks.



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The Woollen Fabric Industry of the Madras Presidency.

THE best woolly breed of sheep in the Madras Presidency is, I learn, the Coimbatore breed. The woolly breed is known in Tamil as kurumbádu, and the non-woolly breed as semmariádu. Woolly sheep are met with in parts of the Námakkal and Perambalúr taluks, and of a few taluks of districts adjoining Coimbatore. The Coimbatore breed, being generally white all over, except the face, is a source of white wool.

The black woolly Mysore breed is met with in the Bellary district and parts of Kurnool, but it is not so good as in its Native Province, and the wool frequently degenerates into straggling hair. "For many years Sir Mark Cubbon had an experimental sheep farm at Heraganhalli, in the Nagamungala taluk, under the charge of a European Commissariat officer. Merino rams were imported yearly from Australia, and the cross-breed distributed all over the country. The breed of sheep throughout the Mysore Province was thus immensely improved. The wool was sent in bales by the Mysore Government to England for sale, as well as for the purpose of being manufactured into blankets and serges. The farm was given up in 1863, as it did not pay expenses."[1]

Neither the Madras, nor the Nellore breed of sheep furnishes, according to Dr. Shortt, wool or hair fit for textile purposes. And the Madras breed has the following wide area of distribution:—Chingleput, Kistna, Godávari, Ganjám, North Arcot, South Arcot, Salem, Tanjore, Trichinopoly, Madura, and Tinnevelly districts.

In six, out of the twenty-two districts, into which the Madras Presidency is sub-divided, viz., Ganjám, Vizagapatam, Chingleput, Malabar, South Canara, and Tinnevelly, no woollen industry is carried on.

The woollen industry of the Presidency resolves itself, for all practical purposes, into two main heads: (*a*) carpets and rugs; (*b*) blankets (kamblis or cumblies). Of these, the extent of the industry and fame of the former are on the decline; the latter are still extensively manufactured in many districts, and have not suffered to the same extent as cotton fabrics from the competition of cheap imported articles. Except so far as jail competition comes in, the manufacture of blankets is able to take care of itself. And I propose to turn the present monograph mainly into a review, pirated from various sources of information, of the position and prospects of the carpet and rug industry.

There are at the present day, as in the past, four chief seats of this industry—Ellore in the Godávari district, Masulipatam in the Kistna district, Walajanagar in the North Arcot district, and Ayyampet in the Tanjore district.

As an introduction and guide to the carpet industry, I may with advantage quote from an industrial report by the Honourable Dr. D. Duncan, Director of Public Instruction, who writes as follows: "Carpet-weaving is carried on, more or less, in seven districts, the cheap seats of the industry being, however, Ellore, Masulipatam, and Ayyampet. The industry has sadly declined as regards the extent to which it is carried on, and, some think, in the style and finish of the manufactured article. On a recent visit to Masulipatam, I found that the industry had, in recent years, shrunk in extent, and deteriorated in the quality of the carpets. I visited several of the principal carpet-weaving establishments, but in none of them did I see anything, which could be favourably compared with the high-class carpets and rugs of Ellore. At Ellore the industry has dwindled into comparative insignificance. This may be due, not to a falling off in skill on the part of the weavers, but to the fact that no high-class carpet had been ordered about the time of my visit. There are now only sixteen important weaving establishments, and carpets and rugs are almost entirely made to order. The industry is carried on almost exclusively by Muhammadans, who, like this community in most other places, are very poor. They have no capital, wherewith to purchase the materials, or to maintain themselves during the time the carpet is being made. Consequently, when a carpet is ordered, an advance of money must be made. Some Madras firms, such as Messrs. Arbuthnot & Co., have an agent at Ellore, who advances the money required by the carpet-weavers, and generally superintends the execution of the work. The carpets are mostly intended for the European market. The approximate annual value of the carpets manufactured at Ellore is Rs. 1,00,000. Mr. Havell, formerly Superintendent of the Madras Government School of Arts, held the Ellore and Masulipatam carpets in high estimation. In his report on the 'Arts and Manufactures of the Northern districts of the Madras Presidency'

[1] Shortt's 'Manual of Indian Cattle and Sheep,' 1889.

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he says,[2] writing of the carpets of the two towns just mentioned: 'Carpets of the superior class, prepared only on special order, are equal in point of finish and material, and infinitely superior artistically, to the imitations of them made in the various jails of the Presidency. There may be a falling-off in treatment of colour, and in the execution of the details of patterns, compared with the finesse in the working of Indian carpets made twenty or thirty years ago; but the blame for this can hardly be attributed to the weavers themselves, and the mischief is not so serious but that a judicious encouragement of the weavers would soon remedy it. The best patterns in use are not inferior to those of old South Indian carpets, which are held up to the disparagement of modern productions. The outcry against the deterioration of Indian carpets, as far as South Indian carpets are concerned, is, in my opinion, not called for. Aniline dyes are very rarely used, as they are at Warangal and other places in Hyderabad, and I have seen carpets from the native looms at the three seats of the industry—Ellore, Masulipatam, and Ayyampet, which are in no respect inferior to old specimens in the hands of connoisseurs in London, or in native houses and palaces. I cannot but think that jail manufactures, which are generally altogether inferior in colour and design, are passed off as coming from the caste-weavers' looms. The good work, to which I refer, is not at all easy to obtain, and the unbusiness-like habits of ordinary native workmen doubtless re-act against their trade.'"

"It is a great pity," Dr. Duncan continues, "that an industry so highly spoken of should be allowed to decline, until it threatens to become extinct. The excellence of the colouring is no doubt due to the fact, regarding which I made enquiries when I visited the carpet-weavers at Ellore, that only native dyes are used. There are ten principal colours, viz., white, green, orange, rose, red, black, sky-blue, burnt-umber, ivory-white, and khâki. [According to Mr. Havell,[3] the dyes most used at Ellore are for crimson or red, stick-lac and sappan wood (*Cæsalpinia Sappan*); yellow, allikaya and turmeric; orange or reddish-yellow, the flowers of the moduga tree (*Butea frondosa*) combined with turmeric; dark and pale blue, indigo. Other colours are produced by combination of the above.] The patterns, I was informed, were brought by Kábul merchants many years ago. These old patterns are strictly adhered to, unless customers wish it otherwise; but any sample pattern can be imitated. The preparation of the dyes, and the dyeing of the wool, are done by the women of the family; the weaving being done by the men and boys. The weaving is carried on in sheds, which are generally somewhat deficient in light and ventilation. The poverty of the carpet-weavers is the chief obstacle in the way of improvement, and, in addition, there are, as Mr. Havell says, 'the unbusiness-like habits of ordinary native workmen.' A steadily growing demand for the best productions of the looms would tend to ameliorate the economic condition of the weavers, and, by alleviating the extreme pressure of dire necessity, might, in course of time, permit of the growth of keener artistic sense, and greater pride in their work, and a determination to maintain a high standard of excellence in material design and finish. At present the poverty of the workers tends to keep ever prominently before them the immediate money return, which they look to for their labours—a condition most unfavourable to excellence of workmanship."

The suggestion has been put forward by Dr. Duncan that, if carpet-weaving is continued at the Madras School of Arts, two or three scholarships might be offered yearly to boys belonging to the carpet-weaving families in Ellore, Masulipatam, and Ayyampet, to enable them to join the School of Arts. On completion of their school course, they would mostly return to their homes, carrying with them wider and more accurate knowledge, and, if not a higher manipulative skill, a more intelligent appreciation of the technique of carpet-weaving. The experiment would seem to be well worthy of a fair trial, provided that the lads' parents will allow them to quit their ancestral home; and their consent to such a measure is by no means certain.

In 1895 a committee, with myself as Secretary, was appointed to report to Government on the working of the Madras School of Arts. In connection with carpet-weaving, the committee submitted a series of questions to the Officiating Superintendent, Mr. E. Holder. These questions, with the replies thereto, were as follows:—

1. Number of weavers engaged and where they were obtained from.	Three men were engaged when the class was first started, one from each of the three towns famous for carpets in South India, viz., Warangal, Ellore and Ayyampet. At present there are two weavers, the Warangal man having left the school in 1892. These men act as teachers to students who do all the weaving as class work. For urgent orders, passed students from the Anjumán and the School of Arts are occasionally engaged on daily wages.
2. Pay of weavers.	The two maistries are paid Rs. 40 and Rs. 20 per mensem, respectively. The extra men employed for urgent work receive from 4 to 6 annas per day. Students learning the work are paid stipends from Re. 1 to Rs. 7-8-0 per mensem, according to progress made and examinations passed.

[2] and [3] Journ. Ind. Art.

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3. How are patterns selected?	In this, as in all the other industrial classes in the school, students are taught to make their own designs, always keeping in view as examples of the best carpets those illustrated in "Oriental Carpets," and the coloured designs sent from the South Kensington Museum, which are sometimes copied, with slight modifications, when specially required by any person.
4. What dyes are used?	Only pure native dyes are used; no aniline dyes. All the dyeing, except indigo, is done in the school. White, brown, and sometimes black wool is obtainable in the natural state. For blue of various shades indigo is used; for black, sulphate of iron and gall-nuts; for red, stick-lac; for yellow, turmeric, and the palás or moduga flower (*Butea frondosa*). The secondary tints are obtained in the ordinary way by mixing two of the primary colours together.
5. Size of carpets made. Any demand for small rugs?	The looms in the school are constructed to weave carpets of various widths from 3 feet to 21 feet, and of any proportionate length. Very large carpets are not much in demand here owing to the costliness of the material, the price being from Rs. 8 to Rs. 12 per square yard. For very small rugs too the demand is not great. The sizes generally ordered range from 7′ × 4′ to 15′ × 9′.
6. Number and value of carpets manufactured since the industry was started.	About fifty carpets have been completed up to date.
7. Is demand in excess of supply?	This being a class for instruction, and the majority of the students being mere boys, who, in addition to weaving, have to attend the drawing and general education classes daily, the work turned out is not even half of what could be done in a regular manufactory employing adults. The demand, therefore, is in excess of supply, as is the case of all the other industries in the school, except pottery.
8. Have any of the weavers gained employment outside the school? If so, where?	No students trained in this class have at any time obtained employment as weavers outside the school. They join the class merely for the sake of the scholarships, which enable them to continue their studies in the drawing classes for the group certificate and diploma. Most of the students from this class, after completing their course, have gone out as drawing teachers or draftsmen.
9. Is there a field for skilled weavers outside the school?	Local enterprise, I may safely say, has been completely ruined by the jails taking up this industry. The best carpets now manufactured in this Presidency are those turned out in Vellore and Bangalore jails, so far as texture is concerned, and even design, for illustrations of the best carpets can now be very easily procured. Besides, what they do in jails ordinarily is to have a few select patterns of borders and ground, which are repeated over and over again, with slight modifications as regards colour, proportion, &c., the work being intended merely to keep the prisoners employed. The men generally put to such work are the "lifers" and "long-term men," who, by constant practice, become really expert weavers, as good in the technical portion at least as any professional.

The committee noted that no students, trained in the carpet weaving class, had at any time obtained employment as weavers outside the school, but that they join the class merely for the sake of the small scholarship, which enables them to continue their studies in the drawing classes. In view, however, of the proposal for the establishment of a school of dyeing, the committee considered that the carpet-weaving industry should not be abolished, at any rate for the present, and suggested the advisability of attention being paid to the improved manufacture of small cheap rugs of good design, instead of to the manufacture of large and costly pile carpets.

The manufacture of rugs is still carried out on a small scale at Wallajah town in the North Arcot district, which was once celebrated for its woollen carpets. At the present day there are only three carpet weaving establishments, with twenty looms, on which rugs are made, by Muhammadans and Hindus, for export to England. The price of the rugs varies from one to seven rupees, and the better quality of rugis only made to order. The rugs are consigned to Messrs. Leighton & Co., Madras, and to Mr. D. E. W. Leighton I am indebted for the following information. The so-called carpets from Wallajah are really rugs, measuring 6′ × 3′. They are known at home as Bangalore rugs. They were originally made at Bangalore, but are now produced at Wallajah, Madras, and other places. There are five qualities, but for export the lowest (or worst) quality is in by far the largest demand. And the reason is that the ultimate buyers are the ten-pound householder, and the seaside lodging-house keeper. I believe that the weavers adhere to the old patterns, but I try to get them to give me as great a variety of colours as possible. As regards the dyes, the larger proportion are indigenous, the smaller are coal-tar. There is one colour of the latter sort (magenta), which the home market objects to altogether, and the weavers make a very good substitute with Indian red. I should think that the annual

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export of these rugs amounted at the outside to ten thousand, of which perhaps two thousand come from Wallajah. Excepting a few for Australia, London takes the lot. Germany, to my knowledge, declines them altogether, and there is no market for them in Paris. The trade has declined in consequence of large speculative shipments being sent home, and sold at prices considerably below cost. So long as London firms can buy on the spot for less than they would pay here in Madras, orders will be scarce, and the weavers must either be idle, or make for stock. I do not believe that the weavers can produce any better description of goods out of the materials at their disposal, which are nothing more than the wool and hair procured from tanneries.

The process of carpet manufacture at Ellore is described as follows in a report received through the Collector of the Gódávari district:—

The manufacture of carpets forms the chief occupation of many Muhammadans at Ellore and its suburbs. Here they prepare carpets of various sizes and qualities. Their prices vary from Rs. 3 to Rs. 14 per yard, some of the longest pieces thus costing more than Rs. 1,000. Their size is not limited, but ranges from 1 to 12 yards in breadth and 2 to 20 yards in length. The method of manufacturing these carpets is similar to that of the cotton cloth manufacture, but slightly modified. The loom is arranged in a vertical position between two strong horizontal beams placed four or five yards apart. The beams are made to turn round upon their own axes. Long threads of hemp or wool are arranged lengthwise in two rows, their extremities being fastened to nails fixed close to each other in the beams. The upper beam is then rolled on itself, until the threads have become tight. Bundles of woollen thread of various colours are suspended on one side of the weaver, so that he may readily take out any of them that he chooses. To begin the carpet, he first of all passes one breadthwise thread through the two lengthwise rows, and then, taking one of the coloured woollen threads, passes it with great dexterity round the lengthwise thread, fastens it in an intricate manner, and cuts it. He repeats the same process with every lengthwise thread, as far as the same woollen thread may be used. Whenever he finds that he has to use a different colour, he leaves off the old one, and takes up the thread of the requisite colour. He is so well practised in the art that he can very easily see where he should use a particular coloured thread, so that ultimately he may complete a particular kind of flower. The passing of the wool round the thread, and the cutting of it, are done so rapidly that it is almost impossible for a bystander to find out in what manner the wool is passed round, and fastened to the thread. After one or two breadthwise lines of wool are completed, he puts another breadthwise thread (of hemp), and presses it tight with an iron comb. The process is then repeated. The work thus begins from the bottom, and rises up. The portion of the carpet which is completed is wound round the lower beam, and, at the same time, the loom, originally wound round the upper beam, unwinds itself. The work is a very slow process even to those who are well versed in it. The difference in the quality of the carpets arises chiefly from the pressure to which the strings are subjected by means of the iron comb. The more closely the breadthwise threads are pressed down, the more durable will be the carpet, and consequently the more costly. They can execute any kind of flower pattern on the carpet.

The following information, bearing on the subject of the Ellore carpet industry, was elicited in the course of an interview with Messrs. Arbuthnot & Co. Four primary patterns are, at the present time, being shipped to London under orders from the Firm of Messrs. Maple & Co., viz., Ashan Khány, Parsey Khány, Gulbundi Umbasha Khány, and Gopal Rao Khány. The demand is greatest, in the English market, for the two first. Vegetable and other indigenous dyes are used. Sometime ago the Superintendent of the Vellore Jail asked Messrs. Arbuthnot & Co. to ascertain how the beautiful Indian red vegetable dye was made. The information was not forthcoming, as the preparation of the dye was said to be a secret process, handed down, like that of the manufacture of some liqueurs, from generation to generation. Carpets with an Indian red centre look like silk, when made of extra quality. The different qualities of Ellore carpets, now manufactured, are as follows:—

a. Ordinary Rs. 6–8 per square yard, delivered in Madras.
b. Exhibition, Rs. 10 per square yard.
c. Extra exhibition, containing 144 stitches to the square inch, Rs. 12–8 to Rs. 15 per square yard.

The size of the carpets averages from 7′ × 4′ to 30′ × 20′. The so-called white centre of the carpets is really camel or ivory (creamy) white, the former being the darker. [As Mr. Dresser points out,[1] "if the ground of a carpet is pure white, it is almost impossible that it look well. When I make this assertion, I am often told that some of the Indian carpets, which I so much admire, have white grounds. This is a mistake. Some of them have light grounds, but not pure white. They have light creamy-grey, or green-white grounds, but not pure white, and this variety of tone altogether alters the case."] At the present time there is a demand for the

[1] 'Principles of decorative design.'

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jumphul border by all orderers of carpets. The Ellore agent has revived four old patterns, which he sends out with numbers, but without specific names. Nearly all the carpets are made on an imported English hemp-twine foundation. Occasionally a cotton foundation is used. A carpet on a hemp-twine foundation will not spoil if it happens to get wet. The carpet weavers at Masulipatam imitate the Ellore patterns, but use inferior materials, and the workmanship is indifferent. They put them on the market at a cheaper rate, and undersell Ellore. The twine is mixed with 'jute' from the Bombay Mills, and mineral dyes are used. Some years ago Messrs. Arbuthnot & Co. executed an order for ready-made Masulipatam carpets at the instance of an American firm in Boston. But the result was not a success, as the carpets wore badly. One effect of competition of jail-made carpets is said to have been that the hereditary weavers receive advances of money from the principal carpet manufacturers, and it is then difficult to get any work out of them, as the rates are so low.

The demand for Ellore carpets seems to be fairly well maintained, as Messrs. Arbuthnot & Co. supply them annually to the value of about $1\frac{1}{2}$ lacs of rupees. Messrs. V. Robinson & Co. have a loom at Ellore, with a Muhammadan agent, who is under engagement with Messrs. Arbuthnot & Co. to supply them only with carpets.

Writing concerning the woollen carpet industry at Ayyampet, Mr. Havell says: [1] "Ayyampet in the Tanjore district was once an important centre for the manufacture of the woollen mats or carpets, for which this district is famous, and about ten years ago 107 families were employed in the industry. Now twelve families only are engaged in it. The patterns and colours of the carpets now made are, as far as I could judge from the few examples available, not so good as those to be found in old carpets; but this is probably the effect rather than the cause of the decline in prosperity, which is owing to native preference for inferior European manufactures. These carpets do not appear to have ever found favour in the European market. The patterns and colours, which are very bold and striking, do not suit the taste of those who, in their painful anxiety to eschew anything vulgar or in bad taste, fall back on the so-called 'æsthetic' muddiness of colour and monotony of pattern."

At the present day I learn, in reply to enquiry made through the Collector of Tanjore, only five families are engaged in the carpet industry at Ayyampet. The sizes of the carpets are 6′ × 3′, 8′ × 4′, and 10′ × 5′, and they cost from ten annas to a rupee per square foot, according to the quality. Only vegetable dyes are used. White wool of superior quality is obtained from Vriddhachalam, and of an inferior quality from Tanjore. Black wool is obtained from villages on the north side of the Coleroon river. The artisans attribute the decline of the industry to absence of demand for articles of native manufacture, which have been driven out by cheap cotton articles made in other places and in jails.

During the preparation of this monograph I interviewed Mr. Kája Hussain Sahib, who is engaged in the carpet industry in Madras city. He was originally taught carpet weaving at the Anjumán in Madras. When the manufacture of carpets was abandoned at that institution, he took over the ten weavers, who had learnt their trade at Bangalore, and started in private practice. He finds that he is steadily losing money, and is thinking of winding up his business. He has very little custom among Europeans, and none among Natives, who buy cheap mats in preference to cheap woollen rugs. A rug, 3′ × 6′, will cost Rs. 3; one of better quality, and of the same size, Rs. 7. A good carpet, 15′ × 20′, will cost Rs. 400. He purchases wool, fine and coarse, from Bangalore, and dyes the wool at his own premises. He employs both indigenous vegetable and imported mineral dyes. The latter, in his estimation, are most effective, as they are at first bright and attractive, but the vegetable colours are more permanent. He showed me a sample of a big carpet with "all over" flower device and wide creamy-white border, made with wool dyed entirely with country dyes (indigo, saff-flower, turmeric, lac, &c.), which afforded a very favourable contrast to a rug ruined by a dreadful European dye.

For the following note on the manufacture of woollen carpets at the Central Jail, Vellore, I am indebted to the Acting Superintendent Mr. G. Cloney.

The industry was apparently introduced about the year 1874, and worked at first on a small scale, viz., two looms for the manufacture of rugs about 6′ × 3′ and 7′ × 4′. So far as can be ascertained, the industry was first taught to the convicts by a professional Muhammadan carpet-weaver from Ellore. The patterns adopted were derived from sample pieces of carpets of various designs—Ashan Kh íny, Ramachandra Kkány, Calcutta-Kashmir Khány, Srinivasarow Khány, Sálar Jung Khány, Gopalrow Khány, &c.—obtained from Ellore,

[1] Journ. Ind. Art, 1890.

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Hyderabad, and Calcutta, and from patterns received from England. The dyes are prepared by convicts, and no mineral dyes are used. At the present day there are 32 looms, which give employment as follows:—

Weaving	81
Dyeing	4
Preparing warp	5
Rolling wool	1
Reeling	1
Warping	1
Joining thread	8
Water-drawing	4
Wool-bowing	6
Spinning	24
Total ...	135

Only long-sentence prisoners are employed in the industry. The spinning of the wool is done by female prisoners. A free (non-convict) foreman (maistry) is engaged to instruct the convicts in the technique of the industry, and several Burmese, and other long-term prisoners, trained in the industry, act as instructors. The largest loom working at present can turn out a carpet 21′ in width, and of any required length. The sizes of the carpets and rugs turned out are 21′ × 15′, 21′ × 14′, 10′ × 8′, 14′ × 14′, 15′ × 12′, 12′ × 13′, 7′ × 4′, 6′ × 3′, and 5′ × 2½′, or other sizes specially ordered. The price ranges from Rs. 7 to Rs. 15 per square yard according to the quality of the texture. Waste wool carpets, made from bits of cast-off wool, which would otherwise be discarded, cost only ten annas per square yard. The carpets are sold in England and the local (South Indian) markets. America was at one time a purchaser, but has now ceased to be so. The annual outturn and sale-proceeds during the last eighteen years are shown in the following table:—

Year.	Number of carpets and rugs.	Sale-proceeds.	Remarks.
		Rs. A. P.	
1881	...	10,514 12 8	
1882	...	12,038 1 0	
1883	...	14,659 0 0	
1884	...	12,893 0 0	
1885	...	7,174 12 0	
1886	...	9,277 0 0	
1887	...	.....	
1888	169	.....	137 rugs.
1889	156	.....	113 „
1890	59	.....	18 „
1891	86	5,646 0 0	44 „
1892	...	9,344 6 10	
1893	183	6,501 10 0	131 rugs.
1894	80	7,742 4 0	42 „
1895	137	11,186 10 0	
1896	111	10,999 15 4	
1897	98	8,068 12 0	

The falling off in receipts during 1897 is explained by the release of prisoners in commemoration of the Jubilee.

The demand for the fabrics is at the present time stationary. Ellore and other factories are competing keenly. [Ellore and Ayyampet complain, *per contra*, that the jails are competing against them,] From Messrs. Maple & Co.'s last letter it would seem that they are overstocked, and Indian carpets do not to-day command that ready sale which they did some years ago.

As in the case of cotton fabrics of jail manufacture, I gather that the convict artisans are credited with no share of the proceeds.

In his 'Eastern Carpets,' Mr. Vincent Robinson gives an illustration of a modern Indian carpet which, he complains, "represents one of the types which the system persued at the Indian jails is gradually driving from existence. It is hardly probable that, twenty years hence, any of the ancient characteristics will remain. Already the mistaken policy of employing prison unskilled labour to make clumsy imitations of an ancient art manufacture

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has had the most disastrous effects. In a few years, the work for which India has been renowned, and which has been of such material advantage to the Native population, will have passed away beyond all power of revival."

Writing concerning the decline in the carpet-weaving industry and other branches of Native art, Mr. Havell[6] attributes it largely to "the spread of European education and ideas, which lead many of the better class of Natives to throw aside their national dress, and decorate their houses in a pseudo-European style with glaring Brussels carpets and ill-designed furniture, and either to look upon all Native art as beneath their notice, or with condescending benevolence to supply the workmen with designs culled from the pattern-books and catalogues of European manufacturers. In this way the Native industries have suffered as much by loss of prestige as by European competition or from any other cause."

Summing up his views concerning the carpets of Southern India, Mr. Havell writes as follows in a pamphlet entitled 'Madras Carpets' (1886); "Madras carpets have lately fallen into disrepute, though probably as good carpets as ever have been made could be turned out, if a healthy demand gave some encouragement to the weavers. Very possibly the carpets which were, until lately, largely manufactured in the jails, and which are still made to some extent, have passed for genuine Native productions. [The productions, *i.e.*, of hereditary weavers.] It is but fair to state that in Madras Jail carpets the colours are from the same pure vegetable dyes as are used by the caste weavers. But it is absurd to suppose that the system of convict labour can produce a result as satisfactory as that accomplished by the skill and taste, partly hereditary and partly acquired by practice from the earliest childhood, of the Native caste weaver, who is not forced, under durance vile, to execute, under fear of pains and penalties, his allotted daily task. What this system can do at its worst was strikingly shown at the last Calcutta Exhibition. The jail carpets exhibited in the Hyderabad Court probably transcended anything which has been before attempted in the direction of outrageous colouring and corrupt design. The carpets made in Madras Jails are, however, generally at the respectable level of mediocrity. The designs are oriental in character, but they are rather heterogeneous, including some borrowed from inferior modern Persian silk carpets, many Cashmere and Punjab designs, generally unsuited to the quality of the wool in use, some good Madras patterns, and others very debased."

Though it would be ambitious to hope that a monograph such as the present one, written, *faute de mieux*, like its predecessor on the Madras cotton fabric industry, by one who is primarily a naturalist, could have any practical result, I have published the recorded opinions of those possessed of the necessary experience to speak with the voice of authority. And, as a sympathiser with the hereditary weavers, who in time of famine, such as we have lately passed through, have to seek the protection of the Government, I would put forth a plea on their behalf as against the long-sentence convict, who is not born a weaver, but becomes one as the result of crime. Far be it from me to wish that convicts should be treated in the manner depicted in 'Never too late to mend.' But I do wish that the convicts, while kept usefully employed, should be employed only at such occupations as are above all suspicion of coming in conflict with the interests of honest folk, whose traditional caste occupation should be protected.

Turning now to the woollen industry other than carpets, which has an industrial rather than an artistic aspect. In the Trichinopoly Jail an extensive woollen weaving industry is carried on, and, as the report with which the Superintendent, Mr. R. Shubrick, has favoured me, contains much interesting detail as to a simple weaving process carried on, like the industry in the hands of hereditary Native artisans, with simple apparatus, I reproduce it in its entirety.

There are now four kinds of woollen article made in this jail, viz., blankets for the Native troops, blankets for convicts, jhools for the Remount Depot at Hosur, and mops for British troops. The wool is obtained chiefly from Bangalore, and is not shorn wool, but what is known as chunam wool, *i.e.*, wool from the skins of slaughtered animals, which is removed from the skin in tanning. It is much cheaper than shorn wool, but the way in which it is removed from the skin makes it very inferior to shorn wool in appearance, feel, and texture. The chunam (lime) removes all the natural oil from the wool, and this accounts for the hard feel of the woollen stuffs made here. I have tried to re-oil the wool by giving the spinners small quantities of gingelly (*Sesamum indicum*) oil to put on the fingers, through which the wool is passed in spinning. The oil was certainly used, but not as directed, being swallowed wholesale. I then tried dipping a milled blanket in oil, and letting the oil drip out of it. This was expensive, and increased the weight of the blanket greatly, but preserved it against insects. All wool, on arrival, is teased to free it from knots and impurities, such as dust, chunam, and stones. It is first passed

[6] Journ. Ind. Art.

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through a jail-made machine consisting of a wooden drum studded with rows of nails, which is made to revolve in a fixed case also studded with nails. After passing through this machine, it is handed over to men to be bowed. The bows are something like a paddle, with a piece of stout cat-gut string across from end to end. The bow is hung from the ceiling, and grasped with the left hand by the man seated on the ground, in such a way that the cat-gut is in the wool and underneath his left arm. He then strikes the cat-gut with a wooden mallet held in the right hand, and makes it spring backwards and forwards in the wool. It is very slow and tiring, besides being very dirty work. If the wool is at all bad, the workshed is full of fine chunam dust. To keep it out, the men tie cloths over their mouths and nostrils. An expert will give 20 lb. of well-teased wool, ready to be spun, in a day. It does not seem to be really unhealthy work, and men generally go up in weight, as the hard work gives them an appetite for the liberal, if monotonous jail rations. In bowing there is a wastage of from 25 to 33 per cent. according to the quality of the wool. After bowing, the wool is taken to the spinners, and spun into cones on very primitive jail-made spinning wheels. It cannot be called hard work, but it is distinctly unpopular with the male convicts, who say it is woman's work.

So far the processes have been the same. But the treatment of wool destined for military blankets and jhools differs from that of wool intended for jail blankets. The manufacture of blankets for the Native army was started by Mr. Gadsden, Superintendent of this Jail, in 1893. The first blankets were made in two narrow pieces sewn together. This join was the weak point, and it was soon found possible to weave the blanket in one piece on a wider loom. The spun wool is warped on pegs, and fitted on to a country pit-loom with no treadles. The strands are passed through gearing fitted into a wooden frame, which the weaver works with his hand, after passing each strand of the wool through the warp. The strands are forced close together by a wooden beam. Only one warp is put on at a time, as the strain of the wool with more, and the constant unrolling of the bundle of warp, unravel the wool. The warps are made about $14' \times 6\frac{1}{2}'$ according to the size of the blanket required. The blanket, when taken off the loom, is a very transparent net, not at all like a blanket in appearance. The warps for jhool are made very much narrower, but somewhat longer than the blanket warps. The starch used for both is made from crushed tamarind stones. On removal from the loom, the blanket is steeped in boiling water to remove the starch, and then rubbed on a rough coir (cocoanut fibre) mat, suspended between supports, by four men standing on either side in pairs. The blanket is rolled up, and the men rub it backwards and forwards across the matting, keeping it wet with hot water all the time. The process lasts about four hours, and mills or felts the blankets. The superfluous wool is rubbed off, the blanket shrinks, and is no longer transparent. It is then pegged out to the required size, and handed over to the tailor, to have the ends sewn over, and to be brushed. It is then ready for sale. The standard size used to be $8' \times 5'$, with a weight or $7\frac{1}{2}$ lb. Now there are several sizes, different regiments having their own size and weight.

Blankets for jhools are milled and stretched like the military blankets. When dry, two pieces are sewn together, cut to shape, and bound with cotton kháki-coloured tape. The jhool industry was started by Mr. Gadsden in 1892. For the present ordinary military blanket, weighing $6\frac{1}{2}$ lb., 8 lb. of spun wool are allowed. The price for regiments varies according to size and quality, the black wool blanket costing more than the grey. The prices for black blankets for regiments, *and the general public*, are from Rs. 2–6 to Rs. 2–10, and for grey from Rs. 2–4 to Rs. 2–8.

The present pattern of jail blanket was brought by the Inspector-General of Prisons from the Yerrowda Jail. It is made of a grey woollen weft, woven into a cotton warp on an English loom. These blankets are made in two sizes, $6\frac{1}{2}' \times 3\frac{1}{2}'$ and $6' \times 2\frac{1}{2}'$. In weaving them, cotton twist is used for the first and last two inches of the weft, to give a surface on which the prisoner's number and date of issue can be stamped. An expert can make $2\frac{1}{2}$ of the larger, and 3 of the smaller, in a day. *The price to the Jail Department is Re.* 1 *and* 11 *annas, respectively. The public pays Rs.* 1–8 *retail, and Rs.* 1–6 *wholesale, for the larger ones.*

There are 47 looms at work, and 294 men, mostly long-sentenced, are employed in the woollen industry. They are taught by the convict maistries and work overseers under the direction of the workshop warder.

Mops are made for use in barracks by British troops. They are made out of waste wool cut-off from the ends of blanket warps. Three strands are spun together on an ordinary country spinning-wheel. The strand so made is trebled, and spun again. It is then cut into lengths of about 12 inches, and run on to an iron four-sided spike. When a sufficient number of strands have been threaded on, the spike is fitted into a bamboo handle, and the mop is ready for sale. The industry, which is an excellent one for old and feeble people, was started in 1895.

Prisoners are, on release, given small sums according to rule, but these sums do not depend on the proceeds of their work.

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The subjoined table shows the outturn and sale receipts of the different woollen articles made in the jail since 1893.

—	1893.		1894.		1895.		1896.		1897.	
	Number sold.	Amount realised.	Number sold.	Amount realised.	Number sold.	Amount realised.	Number sold.	Amount realised.	Number sold.	Amount realised.
		Rs.		Rs.		Rs.		Rs.		Rs.
Blankets	450	1,125	2,565	6,236	2,953	7,419	2,771	6,768	2,123	4,907
Jhools	392	1,860	294	1,395	126	605	140	709	639	3,561
Blankets for convicts	..	..	..	..	..	..	*200	229	*2,624	2,518
Mops	..	..	..	..	*576	484	*616	353	*465	476

* Indicates the number actually turned out during the year.

For the following summary relating to the Native woollen blanket industry, I am mainly indebted to reports received through the Collectors of the various districts, in which the industry is carried on:—

Gódávari.—Coarse blankets are manufactured in 12 villages of the Ellore taluk, 6 villages of the Bhímavaram taluk, and 1 village of the Tanuku taluk. Blankets are also made at the Rajahmundry Jail, in an ordinary country pit-loom, with grey wool obtained from Bangalore.

Bellary.—In the Bellary District Manual (1872) it is stated that "cumblies are the great article of export, and the rugs made in the Kúdligi taluk are in great demand, and are sent to all parts of the country. They are manufactured of various qualities, from the coarse elastic cumbly used in packing of raw cotton, price about six annas, to a fine kind of blanket, price Rs. 6 to 8. In former times a much finer fabric was manufactured from the wool of the lamb when six months' old, and cumblies of this kind sold for Rs. 50 or Rs. 60. These are no longer made." Coarse blankets are at present made in 193 villages, the weavers being mostly Kurubas, who obtained the wool locally, sun-dry it, and spin it into thread, which is treated with a watery paste of tamarind seeds. The weaving is carried out as in the case of an ordinary cotton cloth, the shuttle being a piece of wood hollowed out on one side.

Kurnool.—Blankets are manufactured in 39 villages of the Pattikonda, Nandikotkur, Ramallakot, and Nandyal taluks. Sheep's wool is beaten and cleaned, and spun into yarn with hand spindles. In the case of the mutaka, or coarse cumblies used as blankets by the poorer classes, the thread used for the warp is well rubbed with a gruel made of tamarind seeds before being fitted up in the loom, which is generally in the open air. In the case of jadi, or cumblies of superior quality used as carpets, no gruel is used before weaving. But, when they are taken off the loom, the weavers spread them out tight on a country cot, pour boiling water over them, and rub them well with their hands until the texture becomes thick and smooth.

Anantapur.—Coarse blankets are manufactured in 144 villages as follows:—Anantapur taluk 64; Hindupur taluk 26; Kalyandrúg taluk 36; Penukonda taluk 18. The wool, after shearing, is cleaned and carefully sorted according to its colour. The thread is prepared, like cotton, on a small spindle, and the weaving carried out on a loom of very simple design.

Kistna.—Both carpets and blankets are made in the town of Masulipatam, and blankets only, to a considerable extent, in the Gudiváda taluk. The Tahsildar of Nuzvid, in several villages of which taluk the blanket-weaving industry is carried on, gives the following descriptive note: The sheep, of which it is intended to shear the wool, are first well bathed before shearing. If the wool is not all of the same colour, the several colours are picked out, and piled up separately. This being done, each separate pile is beaten, not as a whole, but bit by bit, with a light stick of finger thickness. Then the cleaning process is carried out almost in the way adopted by cotton-spinners, but with a smaller bow. Then the wool is spun into yarn with the help of a thin short piece of stick, to near the bottom of which a small flat, circular, or square weight of wood or pot-stone is attached, so as to match the force of the whirling given to the stick on the man's thigh. After a quantity of yarn has been prepared, a paste is smeared over it, to stiffen it, so that it can be easily passed through the loom. The paste is prepared either with kajagaddalu or tamarind seeds, when the former is not available. The process of preparation of the paste is as follows:—

(*a*) *Kajagaddalu.*—This is a weed of spontaneous growth, generally preferring sandy or black soil. It has a bulbous root, sometimes as large as a water-melon. The root is boiled in water, and the thin coating

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which covers it removed whilst it is still hot. The root is then reduced to a pulp by beating in a mortar with frequent sprinkling of water. The pulp is mixed with water, to make it sticky and applied to the yarn.

(*b*) *Tamarind.*—The seed is split in two, and soaked in water for several hours. The outer covering then becomes detached, and is removed. The seeds are beaten into a flour of fine consistence, and boiled until this flour acquires the necessary consistency. It is then made into a paste with water, and applied to the yarn.

Cuddapah.—The Jammalamadugu Divisional Officer reports that coarse woollen blankets of various colours are manufactured only in the village of Gurjala. The weavers import dark and white wool from the Anantapur district. The wool is cleaned, spun into yarn by hand, washed, thrown into boiling water, and dyed with powders (mineral dyes) of various colours—red, yellow, green, black, blue and crimson—with which gingelly oil, myrabolams, and areca nuts are mixed to make the colours fast. In weaving, country cotton is used for the warp, and wool for the woof. The total cost of manufacture of a single blanket is Rs. 3–5–0, and the sale price Rs. 4.

The Sub-Collector reports that coarse woollen cumblies are manufactured in 72 villages of the sub-division taluks as follows :—Kadiri 2; Madanapalle 34; Ráyachóti 5; Vayalpad 31. The Tahsildar of Vayalpad further reports that, in addition to blankets, a woollen fabric, known as janam, and used for country saddles and bedding, is manufactured in his taluk. The wool is spread out on a plank or smooth stone, and, after being sprinkled with tamarind paste and conji, beaten with a stick. Another layer of wool is then added, and the process repeated till the required thickness is obtained. The average thickness of janams is about 1½ inch.

Nellore.—Woollen fabrics are manufactured in seven villages of the Ongole taluk, and consist of coarse cumblies used as a protection against wet and cold by day and night. The weavers go to the frontier villages of the Bápatla taluk of the Kistna district, and purchase the right of shearing the goats at the rate of Rs. 12 per 100 goats per annum. The industry is a modest one, for I gather that a weaver turns out annually only 29 blankets valued at Rs. 38–4–0.

North Arcot.—Coarse woollen blankets are manufactured in sundry villages of the Chittoor, Chandragiri, and Palmanér taluks, and in the Kangundi and Punganúru divisions. The weavers are, for the most part, Kurubas, and the blankets are sold principally to the rural population.

South Arcot.—Coarse blankets are made in 49 villages of the Tiruvannámalai taluk; 27 villages of the Trinomalai taluk; 16 villages of the Vriddhachalam taluk; and 3 villages of the Kallakundi taluk. The industry is carried on by Kuruba men and women, and the blankets find a ready sale locally.

Tanjore.—Except for the carpet manufacture at Ayyampet, the woollen industry is carried on only in a single village, Manojiappachavadi, in the Tanjore taluk. Wool is purchased from Walajapet, the seat of the carpet industry in the North Arcot district, dyed red or yellow, and manufactured into cumblies.

Madura.—Coarse blankets are manufactured to a small extent by Kuruba women in 22 villages of the Mélúr, Dindigul, and Palni taluks. The process, from the day of shearing to the completion of the blanket, lasts a month.

Coimbatore.—Rough blankets are manufactured in 59 villages, viz., Coimbatore taluk 23; Kollegal taluk 14; Palladam taluk 11; Polláchi taluk 6. The sheep are shorn twice a year, in March and September, and the wool is sorted into white and black, cleaned with a bow, and spun into thread, which is treated with a gruel made of tamarind seeds and sun-dried.

Salem.—Coarse blankets are manufactured, mainly by people of the Kuruba class, in the following localities :—

Attúr taluk	...	30 villages.
Dharmapuri taluk	...	33 „
Námakkal „	...	22 „
Tiruppattúr „	...	32 „
Uttangarai „	...	14 „
Tiruchengódu „	...	...
Salem „	...	5 villages.
Krishnagiri „	...	6 „

Trichinopoly.—Except at the Central Jail, only coarse blankets are made throughout the district.

GOVERNMENT MUSEUM, MADRAS,
2nd September 1898.

EDGAR THURSTON.

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Monograph on Wood-Carving in Southern India.

FOR the following excellent account of sandal and other wood carving in the Mysore Province I am greatly indebted to Mr. J. E. A. D'Cruz of the Mysore Public Works Department:—

Mysore includes in its rich and varied flora the sandal (*Santalum album*: sriganda) and the teak (*Tectona grandis*) trees. Their importance and value were early recognised, and, in the first arrangements for the conservancy of forests, these woods were reserved, and any wood, except teak and sandal, was allowed to be felled on payment of a small seigniorage. Sandal has been for a long time a State monopoly, and has yielded the largest portion of the forest revenue. The girth of a mature tree varies from 18″ to 36″, or sometimes attains 40″. The tree takes many years to mature. In its colour and marking, which depend greatly on its age and locale, four varieties of the wood are recognised:—bili (white), kempu (red), nága (cobra), and navilu (peacock). The two latter are the best, and realise the highest prices. The best heart-wood is used for carving, and the roots, said to be richest in oil, with the chips and shavings, find their way to Bombay, China, France, Germany, and America. The oil forms the basis of many scents, and is also used medicinally. The wood is highly scented, close-grained and tough, and, from the fineness and evenness of its structure, is capable of the most delicate carving.

The art of sandal-wood carving is confined to a few families, belonging to the Gudigar caste, in the Sorab and Ságar taluks of the Shimoga district in the north-west corner of the province. There are two or three families in Ságar, and about six in Sorab, which contribute in all about thirty-five artisans at present employed in the craft. The art is also practised by their relations, who found a domicile in Hanavar, Kumpta, Sirsi, Siddapúr, Biligi, and Banavási in the North Canara district. But the work of the latter is said to be by no means so fine as that executed by the artisans of Sorab and Ságar. The artisans of North Canara, however, excel in pith-work (an allied art) of the most exquisite beauty. They usually make basingas—special forehead ornaments, richly inlaid with pearls, and worn by men and women on the occasion of marriage.

The Gudigars are reported to have come originally from Goa, their migration to the towns named above having been occasioned by the attempts of the early Portuguese invaders to convert them forcibly to Christianity. The fact that their original language is Konkani corroborates their reputed Konkanese origin.

They say that the derivation of the term Gudigara is from gudi, a temple, and that they were so called because they were employed in their own country as carvers and painters in the ornamentation of temples. Another possible derivation of the word is from the Sanskrit kuttaka (a carver). They assure us that their fellow castemen are still employed in turning, painting, and other decorative arts at Goa. The Gudigars, in common with the Chitrakaras (ornamenters or decorative artists), claim to be Kshatriyas, and tradition has it that they adopted the profession of carvers, car-builders, or Gudigars "to escape the wrath of Parasu Ráma in the sixth incarnation of Vishnu, who vowed to destroy all Kshatriyas." It may be that, as a once dominant and opulent class, they took to the fine arts as a pastime, and, when times changed, adopted them as a means of livelihood. The sandal-wood carvers are also expert in carving ivory. As the Hindu caste system is connected with the profession followed, it seems possible that the Gudigars of Mysore may be distantly connected with the Kondikars or ivory-carvers of Bengal—Rungapúr and Múrshidábád.

The tools employed by the artisans are primitive, and, although of many shapes and sizes, may be classified as follows:—

(1) The saw, from the ordinary hand-saw for cutting the log into planks, to a very fine hand fret-saw employed for cutting the teeth of combs. The fret bow-saw, which forms a part of the equipment of carvers generally, is not used.

(2) The plane, ordinarily manufactured by the village artisan, for smoothening the surface of the plank to be operated upon, and for planing cornices or mouldings.

(3) The mallet: a slip of wood about 9″ by 1″ by ½″.

(4) The hone: a rough slab of fine-grained, hard stone, with one face rubbed down, for sharpening tools.

(5) The chisel, which is of various forms, viz., (1) the firmer, a flat instrument square, curved, or skew-edged, the last for working in sharp corners; (2) the gouge, or hollow chisel of varying size and

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curvature of edge; (3) the engraver. The sizes of the chisels vary from $\frac{1}{2}''$ to a width scarcely greater than that of the point of a steel nib.

The tools are made from European umbrella spokes, ramrods, and country steel.

As he squats on the ground in characteristic Indian fashion, the carver wants neither table hold-fasts, hand-screws, nor dogs. He holds down the piece he is carving with one hand, while he carves with the other. At times, if need be, he thinks nothing of enlisting the aid of his toes, to supplement his hands in holding the piece which he is engaged on. He generally places it on a tripod about $1\frac{1}{2}'$ square and a foot from the ground, so as to have it sufficiently near his eye, and turns it round in any direction he requires for the convenient use of his tool. Having selected his wood, the carver cuts it into slabs or planks of the size and thickness required, which he proceeds to plane and join together, and so construct his cabinet, mandasana, glove-box, or whatever article he is about to execute. Having finished the planing and joining work, he takes the parts to pieces, and proceeds to inscribe the design or pattern by drawing it on the smooth surface of the wood with a pencil. If the design is very intricate, he draws it on a piece of paper of the same size as the slab, and glues it thereon. He then proceeds to mark or engrave the pattern on the wood with an engraver, outlining the design in all its details. The next process is "bosting," or cutting away roughly between the outlines of the pattern, by which means he gets a rough model of the subject, which he proceeds to finish. He starts with a large tool, and goes over the work several times with tools of finer and finer edges, till he perfects his work in every detail of shape and curve, and gradually gives it the light and shado, the bold relief and deep under-cutting, which give his work the beauty and finish, for which it is celebrated. The minute details and characteristic fineness of the work are effected by the smallest veiners and eye-tools, of which the artisan has a great number and variety. A peculiarity of the sandal-wood carver of Mysore is that he disdains a file, and does the cleanest and most finished work with the chisel alone, aided by the fine texture of the wood and the extreme sharpness of his tools. Owing to the constant strain which the fine lace-like work he is employed on imposes on his eyes, the eyesight of the Gudigar is known to fail in early life.

The only flaw, readily discernible in the beautiful work turned out by the Gudigars, is their inferior and clumsy joining work, which is, however, beside their art, and belongs more to the domain of the cabinet-maker. It is also noticeable that, in cabinets most richly carved, drawer-knobs are of the plainest and roughest description, resembling those of an inferior bazár-made article.

The early improvement in the art of sandal-wood carving in Mysore, which far excels the art as practised in the adjoining towns of North Canara by the same caste, may be attributed—

(1) To the abundance of sandal-wood at Sorab and Ságar, as an artisan, who constantly works on it, cannot but soon become aware of the possibilities of a wood of its characteristic texture for elaborate and delicate carving;

(2) To the patronage of the early Mysore chieftains or Poligars;

(3) To the object lessons in design, afforded by the beautiful and elaborate stone-carvings in the neighbouring temples of Halebid and Belgavi.

For the last century, however, the art may be said to have remainder *in statu quo*. The stagnation may be accounted for by the following facts:—

(1) That to master its technicalities is slow and tedious work;

(2) That an inborn artistic taste is necessary for success in the art;

(3) That the art is not taught, but acquired by patient observation and imitation on the part of the novice, while there has been no effort or pretence on the part of the master craftsman to teach the art even to his own children;

(4) That the oriental conservatism of a caste or trade-guild tends to the strict reservation of trade secrets within the limits of the guild.

Some, or all of these causes have tended to centralise the art, and make it the exclusive property of the few who practise it at the present day.

The stimulus, which the art receives from time to time at the present day, is from orders from the Government, corporate public bodies, or Máharájas, for address boxes, cabinets, and other articles, specially ordered for presentation, or for the various fine art exhibitions, for which high prices are paid. But it is believed that, although the encouragement thus offered tends to increased excellence in the technique of the art, it has no effect in spreading a knowledge of it, or in calling more craftsmen into existence, as the orders are rarely so large as to be beyond the producing capabilities of the few who are at present engaged in the craft. In conversation with the workmen imported from Sorab and Ságar for work in the palace now being

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built for H.H. the Máharája of Mysore, which affords an admirable object lesson for those interested in the question of technical education, it was elicited that there are several Gudigars who, from the want of a due taste for the art, never acquire it, but are employed in carpentry and turning. Others, having acquired lands, are engaged in cultivation, and fast losing all touch with the art.

Viewed as an industry, sandal-wood carving is certainly insignificant. The articles ordinarily manufactured for the native market are combs, toilet paint-boxes, jewel boxes, and small images, and shrines or mantapas, toys, *e.g.*, horses, camels, elephants, lions, deer, etc., chess-men, fans, and walking-sticks. The articles turned out for Europeans are card-cases, pencil-cases, watch-stands, mirror and photograph frames, album covers, ink-stands, paper-cutters, pen racks, envelope boxes, book racks, and walking-sticks. The more artistic creations are generally address boxes, caskets, cabinets, jewel boxes, and writing desks for presentation purposes. Very artistic work is also done in the carving of images and mythological subjects, which are much valued and patronised by the wealthier Hindus and members of the aristocracy, and kept in their houses like sacred pictures. But no worship is made to them, as Hindus only worship idols of stone or metal. A great number of mythological subjects have been executed for the new palace at Mysore, to fill in niches in screens, and in panels over doorways, etc. Another article worthy of note is the chamara, made with a bunch of fine hair-like strips of sandal-wood, attached to a highly ornamental handle, and usually waved before the throne of a Máharája on State occasions, or before the image of a Hindu deity when carried in public procession. A gold medal was awarded, at the recent Delhi Art Exhibition, for a magnificent sandal-wood casket ornamented with panels representing hunting scenes.

The sandal-wood carver earns from 12 annas to Rs. 2–4 per diem. At home, when he receives an order for a costly and elaborate piece of work, if not furnished with an advance, he usually spends a few days in the manufacture of stock bazár articles, which procure for him the necessaries of life for the period during which he is occupied over the more laborious task. His earnings are also supplemented by the combs, toys, and other elementary carvings executed by such of his children as show an aptitude for the art, and are learning its details. The artisans are ordinarily engaged in work of the coarser kind, which finds ready purchasers in the local market. They sometimes make a varied collection of their work, and take it to Mysore and Bangalore. Some receive advances and commissions for fancy articles from fancy-goods merchants and "artware salesmen" of Madras and Bombay. But the best articles depend on commissions from the Government or municipalities, European residents or visitors. To sum up the industrial aspect of the question, it appears that the producers are few in number, the variety of articles manufactured limited, and the market circumscribed.

The following extract from a note by Colonel C. Bowen, R.E., contains valuable information on the subject :—

"In India, as elsewhere, the art instinct of the people first found expression in the decoration of its temples; and, when the instinct grew into the desire for the decoration of dwellings or of articles in ordinary use, the figures, columns, and carvings of the temples were naturally adopted for the purposes, altogether outside of religion. So we find, from the beginning, the sandal-wood carvers followed the models before them on the walls of their shrines. Unfortunately, after the architects and sculptors who elaborated the walls of Belgavi and Halebíd had disappeared, a period of distinct art decadence appears to have set in, and has lasted down to the present day. No original artist arose to treat the subjects of the Hindu Pantheon with entire originality, or to effect improvements on the designs of his predecessors; and the wood-carvers have slavishly adhered to the same original models with the result of establishing in their work a purely conventional style. In every article that we have seen, unless in the few cases when the copy of a European picture or print has been attempted, there is to be found the same ever recurring type of Hindu god or demon, of flower and foliage, of tracery and border. There may be diversity in the arrangement or juxtaposition of each conventional part, but the art impression conveyed on the mind by one carved article, whatever it be, is exactly that conveyed by another.

"In mediæval Christian art we find that pictorial teachings in painting and sculpture were the medium of propagating a knowledge of Christian facts and doctrines, and of profane and romantic history. A traditional way of treating these subjects was adhered to by artists of all kinds, and the same mode of treatment was maintained for centuries. Yet we find that the mediæval artists were not mere slavish copyists, and, though they retained the traditional elements of the subjects and the conventional arrangement of them with curious fidelity, the style of art varied from time to time, and the artist told his story in the art vernacular of his own day. He worked very freely in the details of his picture, translating the customs and architecture, and

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other accessories into the fashions of his own time. In ancient Greece the same course had obtained, and it produced the greatest artists and the greatest works of art. Between these and eastern art, as embodied at least in Mysore architecture, sculpture, and carving, a parallel may be drawn as regards the adoption of traditional subjects and modes of treatment, but the parallel stops abruptly when we come to variety in expression and to modifications or improvements of the original examples. Centuries ago, in Mysore, a few beautiful types were created; for a time perhaps slight variations on these were introduced; but stagnation followed, and artists in stone and wood degenerated rapidly into mere copyists, and copyists pure and simple they have remained to the present day."

The following extracts from Mr. L. Rice's Mysore Gazetteer may also be appropriately quoted :—

"The designs with which the Gudigars entirely cover the boxes, desks and other articles made, are of an extremely involved and elaborate pattern, consisting for the most part of intricate interlacing foliage and scroll work, completely enveloping medallions containing the representation of some Hindu deity or subject of mythology, and here and there relieved by the introduction of animal forms. The details, though in themselves often highly incongruous, are grouped and blended with a skill that seems to be instinctive in the East, and form an exceedingly rich and appropriate ornamentation, decidedly oriental in style, which leaves not the smallest portion of the surface of the wood untouched. The material is hard, and the minuteness of the work demands the utmost care and patience. Hence the carving of a desk or cabinet involves a labour of many months, and the artists are said to lose their eyesight at a comparatively early age. European designs they imitate to perfection." And again : "The article of their (the Gudigars') manufacture chiefly in demand are boxes, caskets, and cabinets. These are completely covered with minute and complicated scroll-work, interspersed with figures from the Hindu Pantheon; the general effect of the profuse detail being extremely rich. The carving of Sorab is considered superior to that of Bombay or Canton, and, being a very tedious process requiring great care, is expensive. The Gudigars will imitate admirably any designs that may be furnished them. Boards for album covers, plates from Jorrock's Hunt, and cabinets surrounded with figures have thus been produced for European gentlemen with great success."

It will be apparent from the illustrations alone that the Gudigar, though limited in the range of his subjects, is a true artist in the technique of his art, whether it be in surface carving, *cavo relievo*, *intaglio* or incised work, high relief, or deep under-cutting, in pattern work, scroll, foliage or figurini, and in minutiæ of detail and delicate finish. He is also able to execute from a photograph an image, which bears a very fair likeness to the original.

Although much has been done to improve the art by making the Gudigars contribute specimens of their work to exhibitions, thereby enlisting the *amour propre* of the artist, and by paying well for work of special excellence, it appears that much can still be done both for the art and industry. In connection with the construction of the new palace at Mysore, an endeavour is being made to improve their ideas of human proportions and features by means of clay models executed by men trained in the School of Art. The art instinct of the Gudigars at once tells them by comparison where their old and grotesque ideals of face and form are faulty, but the results are not very satisfactory. The characteristic oriental expression is lost, and a better drawn but insipid mask is substituted. It seems possible that, if photographs of Indian home life and scenery were put before them, a great deal more of reality and expression would be imported to their carvings, apart from the increased range in design. Photographs also of pure Indian design from temples in other parts of Southern India might tend to vary their ornamentation and beautiful scroll-work.

The children of the Gudigars, who are early taught to draw their beautiful scroll-work and designs on a slate, may be educated regularly in free-hand drawing and sketching, and, without departing from the pure oriental style, be made capable of a greater variety and a wider range of subjects in the art.

While the delicacy and costliness of the wood render any extension of its use for industrial purposes impracticable, the same qualities make it peculiarly suitable for the production of works of art. Any improvement, then, in the position of the workmen or their craft will be due to the opening up of new markets for work of the highest artistic value. These would necessarily be sought for in those great cities of Europe and America, where art is highly valued and rewarded. But, if this object is to be attained, Government assistance will be required for some years to come.

Turning now to teak and other wood-carvings, Mysore teak is locally regarded as stronger than, though not so highly developed as the Burma wood, and its superiority in strength is usually attributed to its close grain, and to the presence of oil in its pores, which is driven out of Burma teak in the process of seasoning. It is also supposed to be better suited for carved work, as it responds better than the Burma wood to the tool of the carver.

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The best specimens of the ancient teak carvings of Mysore were consumed in the fire of February 1897, which reduced to ashes the frontage and most ornate portion of the old palace, with the valuable relics of the ancient art of Mysore. What can now be seen of the art in Mysore, as in many other towns of Southern India, are *cavo relievo*, or flat patterns on the lintels and sides of doors, and on columns in Hindu houses, and specimens of figurini and scroll-work on Hindu temple cars which are richly carved with swámis and grotesque figures. Existing photographs of specimens of ancient carvings illustrate how effective and pleasing wood-carving can be made without the labour involved in the modern intricacy of design, as instanced in the beautiful door-frames and panels which have been recently executed for the new palace in course of erection. In the specimens of the old school, consistent purity of oriental design is noticeable, with all the grotesqueness of features, extravagance of pose, and disproportion of the figure; but the work is full of passionate expression. In the modern specimens of the art, by the native artisans from the Madras School of Arts, and from the well-known cabinet makers, Messrs. Deschamp & Co. and others in Madras, there is a decided improvement in beauty of face, regularity of form, and natural pose of figure, with a distinct insinuation of western style in the scroll, foliage, and figurini, suggestive of a European rendering of eastern design.

The Mysore carver, it is satisfactory to note, still shows a decidedly oriental style and taste in his design and work, although he is fast learning from the Madras artisans the more advanced technique and better finish of the latter.

LIST OF ARTICLES ORDINARILY MADE IN SANDAL-WOOD.

Comb	4 to 8 annas.
Toys	8 annas to Rs. 2.
Images	Rs. 3 to Rs. 8.
Book-rack	Rs. 30 to Rs. 75.
Paper-cutter	R. 1 to Rs. 4.
Watch-stand	Rs. 6 to Rs. 50.
Photograph frame	Rs. 50.
Envelope box	Rs. 20.
Pen-rack	Rs. 2 to Rs. 10.
Card-case	Rs. 5 to Rs. 15.
Fan	Rs. 3 to Rs. 15.
Casket	Rs. 250 to Rs. 600.
Walking-stick	Rs. 6 to Rs. 50.

The ordinary rate of carving is 10 annas a square inch.

J. E. A. D'CRUZ.

It is stated by the editor of the South Canara Manual that the more well-to-do classes of the Bants occupy substantial houses on their estates, in many of which there is much fine wood-work, and, in some cases, the pillars in the porches and verandahs, and the door-ways, are elaborately carved. And the author of an article in the Calcutta Review on the Bants of the Tulunad writes that "the wood-work of their houses is often richly and artistically carved. Canara, with its great mountain forests, yielding an abundance of ivory and a wealth of timbers that readily adapt themselves to the most delicate needs of the carver, was at one time the home of the most deft, skilful and artistic wood-carvers, whose descendants in all probability are the Gudigars, who at the present day are found scattered in Goa, Honavar, Mysore, and some other tracts in south-western India. These hereditary carvers had a shastram or science of their own, which, with wonderful exactitude, and the keenest botanical knowledge, defined and described the various kinds of wood suitable for rough or delicate carving, the age, season, and locality in which these woods ought to be felled, those species which require to be used alone, and those that would answer when used conjointly with other varieties, etc."

At Mudabidure, or Mudbidri, in the ruined palace of the Chautor, or local chief who follows the Jain creed, are some splendid carved wooden pillars, two of which bear representations of the pâncha-nâriturage, *i.e.*, the horse composed of five women. These are fantastic animals, which are formed by the bodies of a number of shepherdesses for the amusement of their lord Krishna. Writing concerning the Jain temple at Mudbidri, the doors of which are most elaborately carved, Fergusson states * that the architecture of the Jain temples in Tuluva is neither the Dravidian style of the south nor that of Northern India, and indeed is not known to exist anywhere else in India proper, but recurs with all its peculiarities in Nepal. The reverse slopes of the eaves above the verandahs is the feature which specially resembles the style common in Nepal. He describes the exterior of the temples as much plainer than Hindu temples usually are, and he considers that the sloping roofs of the

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verandahs are so evidently wooden that the style itself cannot be far removed from a wooden original. In support of this view he mentions that, in many places, on the west coast below the ghauts, the temples are still wholly constructed in wood without any admixture of stone, and almost all the features of the Mudbidri temples may be found in wood at the present day. With regard to the interiors of the temples, he remarks that no two pillars seem alike, and many are ornamented to an extent that may seem almost fantastic, and this again is an indication of their recent descent from a wooden original, as long habit of using stone would have sobered their forms. In this connection Mr. Logan * states that the buildings of the kind in Malabar are invariably built of wood in all their characteristic portions, and points out that the style of architecture noted by Fergusson marks out better than anything else the limits of the ancient kingdom of Chéra, for the style prevails all along the west coast country from the limits of Canara to Cape Comorin, having been adopted even for Muhammadan mosques. Typical examples of the style of architecture met with abundantly in Travancore, are illustrated, from negatives kindly supplied by Mr. Narayana Iyer, in plates IX and X.

Tirupati wood-carving.—An extensive industry is carried on at Tirupati in the North Arcot district and the adjacent villages by men of the carpenter caste, Balijas, Muhammadans, and others. The wood which is most used is red sanders (*Pterocarpus santalinus*), which is obtained from the neighbouring hills and the forests of the Venkatagiri and Kálahasti zamindaris. It cannot, under the Forest Act, be removed from the reserved areas without a license fee. It is sold at Tirupati for Rs. 25 to Rs. 30 per ton. The wood-carvers say that they cannot get logs of more than a foot in diameter, as logs of larger size are taken by merchants to Madras and other places, for making house-posts. "Large sums are often given for the wood by rich native gentlemen, who take a pride in having their verandah posts prettily carved and ornamented." (Gamble.) The majority of the carvers get branches only a few inches in diameter, which are sold at the rate of R. 1 per head-load. Owing to the increase in the price of red sanders wood and the difficulty in procuring it, the carvers are now using a white wood called répalla or pala (*Wrightia tinctoria*) for carving figures.

The industry is an old-established one, and has made considerable progress in recent years both as regards the quantity and quality of the work turned out. A good carver can earn a rupee per diem. Thirty years ago there were only two or three shops at Tirupati where the carvings were sold, whereas, at the present day, there are more than a dozen shops, and, in addition, persons from the villages hawk them about the streets.

The original model was the figure of Venkateswara-perumal, which is worshipped in the temple on the Tirupati hill. Old specimens show that the artisans did not pay much attention to the back of the figures, but were satisfied with carving the front only. In recent years they have begun to pay more attention to the external anatomy, and to give a better finish to their work, which though rough, is executed in a bold free style.

Figures of swámis (deities), men, mythological animals, elephants, and miniature temple cars with flying cherubs and winged horses, are most abundantly carved; but domestic utensils in the shape of chembus, kinnis, cups, plates, etc., are turned on the lathe. The largest figures are about twenty inches high, and cost from Rs. 12 to Rs. 15 per pair. Large vessels are sometimes made of the wood of vépi or áchamaram (*Hardwickia binata*), which resembles red sanders wood, but is more liable to crack. This timber is worked as soon as it is felled, and, as it is heavy, men go to the forest and set up a temporary workshop there. The price of vépi is only about Rs. 12 per ton, and ordinary purchasers cannot distinguish it from red sanders wood.

The carvers sell their wares to shop-keepers, who advance money to them, and supply them with timber. The carved figures are sold to pilgrims and others who visit Tirupati, and are also taken to Conjeeveram, Madura, and other places, at times when important temple festivals are being celebrated. Some petty traders sell their carvings at railway stations, *e.g.*, Rénigunta and Arkonam. In recent years some of the carvers have been patronised by the railway employés, who order the most expensive articles, to send to friends in various parts of the Presidency, and even to Europe.

Vessels made of red-wood carry no pollution, and can be used by women during the menstrual period, and taken back to the house without any purfication ceremony. For the same reason, Sanyásis (ascetics) use such vessels for doing púja. Carved human figures, male and female, represented in a state of nudity, are purchased by Hindus. Those who are childless perform ceremonies, *e.g.*, ear-boring, as if they were their children, in the belief that the performance thereof will bring issue to them. Or, if there are grown-up boys and girls in a family who remain unmarried, the parents celebrate the marriage ceremony between a pair of the figurines, in the hope that the marriage of their children will speedily follow. They dress

* "Manual of Malabar."

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up the dolls with clothing and ornaments, and go through all the details of a real marriage. Some there are who have spent as much money on a doll's marriage as on a marriage in real life.

Tirupati seems to have been a centre, where wood-carving for architectural purposes flourished, and even obscure villages bear witness to the fact that the industry was well patronised in bygone days. Old houses, of even comparatively poor people, possess some carvings, *e.g.*, on the door-frames, lintel, etc. Quite recently a native gentleman at Tirupati purchased one of the oldest houses in the town, which possessed many carved pillars, architraves, etc. He pulled down the house, and constructed a new one, which possessed no carvings, but all the pillars, brackets, etc., were made of plain Burma teak painted blue. The old carvings were thrown away, and heaped up in the back-yard. In the construction of houses, the lintel of the main doorway is invariably carved, and in the centre there may be a lotus, figure of Lakshmi, Ganésa, or other household god.

Cocoanut carving was introduced into the Cannanore Jail as an industry about 1888. At first Burmese prisoners were set to the work, and, in course of time, the art was acquired by prisoners of other nationalities, principally the Muhammadan Mappilas of Malabar. Large double cocoanuts (coco-de-mer) are richly carved with Burmese figures and peacocks, and supported on elephants and tigers carved in ebony. Cocoanuts intended for sugar-basins, cruet sets, teapots, etc., are engraved in panels bearing richly carved figures of peacocks and Burmese men and women. At Karkal, in South Canara, young cocoanuts are, in like manner, neatly carved with conventional, floral, and mythological designs. And in Travancore very spirited and well executed designs are carved in cocoanut shells. Concerning cocoanut carving in Travancore, Mr. Narayana Iyer, Superintendent of the Trivandrum School of Arts, writes as follows:—"The Malayalam proverb, known throughout Malabar, 'to carry a cocoanut shell,' means to beg, this shell being the vessel commonly used by beggars for the receipt of alms. The fruit of the bilva tree (bael: *Ægle Marmelos*) used to be ornamented with elaborate carvings, and mounted with silver and gold, for the purpose of keeping the holy ashes by Sivaites. Such carved fruits are still found in many houses, and preserved as sacred. The cocoanut appears to have attained its religious importance from an incident in the Padmanabha-swámi temple at Trivandrum, which took place, it is said, nearly 900 years ago. A Namboori Sanyási, by name Vilwamangalathu Swámi, who was greatly revered throughout Malabar, used a half cocoanut shell, in the shape of a cup, for presenting offerings to the deity. This very cup is said to be still used in the temple, mounted in gold and set with precious stones, in honour of the Sanyási. Since the foregoing incident, the cocoanut shell has received the title of Padmanabha-swámi's vessel. The shell must have been originally scraped and polished for domestic and culinary purposes. Ornamentation by carving and piercing are of more recent origin. It is now used for the manufacture of bangles, watch-chains, sticks, and other articles. Small shells are used for carving with various artistic devices. The shell is tough, but requires great care and delicacy in carving, or the fine details are liable to crumble. The colour of the shell, when polished, is a fine dark brown, which becomes darker with age. The tender shell, which has an ivory hue at first, is sometimes used for carving, but it becomes yellowish after a time."

A modest but interesting industry is carried on at Udayagiri in the Nellore district, concerning which the Rev. F. W. Stait writes as follows:—"In Udayagiri, a village of some note before the days of British rule, there lives an old Muhammadan, who twenty-five years ago used his knife with unusual skill in the manufacture of wooden sandals. As he worked he thought, and from his deliberations a wider sphere opened before him. Why not prepare wooden articles that would increase his income? So he tried his hand on the shapening of spoons and forks, watching for new ideas, and carefully copying any new design that he came in contact with. For years he and his son toiled on, barely making ends meet. But, as his skill increased, his circle of customers grew wider and wider. Dainty boxes in delicate fretwork were carved out of solid blocks. Paper-knives in many designs were prepared. Card trays, the work in which seemed more like fine lace than mere wood-carving, were put upon the market. I interested myself in the work of one who showed such a wonderful natural talent, and, through my influence, the articles were introduced into several business centres. At the present time Mohammed Ismail Usuff Nanobai and five members of his family are kept constantly at work, and, even with all their efforts, are unable to meet the demand. The most interesting point in the history of this little industry is the fact that it is all the outcome of personal talent and application, for not only did Nanobai carry on the work and design the articles, but he also made his own tools and instruments as the need unfolded itself. He is unable to make the boxes, which he turns out, during the hot months, as the wood cracks under the knife."

To Mr. Alfred Chatterton I am indebted for the following note on wood-carving at the Madras School of Arts and Madura Technical Institute.

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This institution owes its origin to the disinterested efforts of the late Dr. Alexander Hunter, M.D., who in 1850 established, at his own expense, a school for the promotion and encouragement of industrial arts in the Presidency. The object was to arrest the decay of indigenous arts, and to introduce new industries where the need for such was keenly felt. After a short time the school was taken over by Government, and during the fifty years of its existence as a Government institution, it has done much to achieve the objects with which it was originally founded.

Wood-carving was first started in 1877 in a desultory kind of way, and some years later, a regular wood-carving class was established with one Meenakshi Asári of Ramnád as the maistry (foreman). He was succeeded by his son R. Kalimuthu Asári who is still in charge of the class, so that the father and son, between them, are largely responsible for the nature of the influence which this school has had upon wood-carving in the south of India. Although, at the outset, the class was not very popular, yet, owing to the demand for carved furniture among Europeans being greater than the supply, the pupils of the school were able to obtain good wages, and its popularity, in consequence, soon increased. About the same time, a metal-worker, Ramaswamy Stapathy by name, was also employed in the school to teach repoussé work, in copper and silver, of the type which is largely employed in the ornamentation of the vahánams which form such an important feature in all the religious ceremonies connected with the great Dravidian temples of Southern India. This repoussé work is also found on the doors of temples, on the dwijastambams or flagstaffs and on the walls of the innermost shrines, the plates being usually made of copper plated with silver or gold, or, in some instances, of pure silver.

Throughout the whole period of its existence the wood-carving department of the school has been devoted to the ornamentation of European furniture. The frame work or structure is that of the modern cabinet maker, but the ornamental details are adapted from Dravidian models. Ebony and sandalwood-carving have always been done, to some extent, under the superintendence of native experts in this particular line. But the great bulk of the work done in the school has been in teakwood, and blackwood or 'rosewood' (*Dalbergia latifolia*), more particularly the latter. Copper repoussé panels in blackwood frames are an exceedingly effective combination, and have been largely employed in the furniture manufactured by the school during the last fifteen years. It is an unfortunate fact that, of the earlier work done in the school, but few photographs or drawings have been preserved, and all the illustrations are of work done during the last two years, and the majority from the specimens of wood-carving specially prepared for the Delhi Durbar Exhibition. The general features of the style of wood-carving are directly copied from the stone temples of Southern India. These latter are almost entirely constructed of crystalline rock, which is obtained from the quarries in large slabs or long pillars by the burning process. Such material lends itself readily to a type of construction which is still more easily carried out with wood, so that there is nothing incongruous in the reproduction in wood of the stone carvings of Dravidian temples. The origin of this style of architecture is lost in the mists of antiquity, but it is known that at a very early date the principal features had become crystallized in a series of rules for construction, contained in a set of treatises collectively known as the Silpa Sastras. Of these books there were apparently thirty-two principal, and as many subordinate. The majority of these treatises have disappeared, but from such as still remained, Rám Ráz, a native of Tanjore, produced a valuable essay on the architecture of the Hindus, which was published by the Royal Asiatic Society more than seventy years ago. The Hindu orders consist of four principal parts, viz., (1) the upapitha or pedestal ; (2) the athisthana or base ; (3) the sthamba or pillar ; and (4) the prastara or entablature. Of pedestals there are three kinds: the first is called Vedi Bhadra, the second Prati Bhadra, and the third Mancha Bhadra. Each of these is again divided into four sorts, making, in all, twelve, each differing from the other in its formation and in ornamentation. Of bases no less than sixty-four are enumerated in the Manasara, whilst of pillars there are seven kinds, but the entablature of the Indian order admits of but little variation. Hindu architecture reaches its highest flights in the construction of vimánas or pyramidal temples, and in gopurams or gateways consisting of from one to sixteen storeys, each storey being a complete representation of a Hindu order. Elaborate rules have been framed, regulating the proportions of the various parts. On Plate XI are given typical sketches of pedestals modified to suit wood designs, with the names of the various mouldings. Plate XII, Figure 1, is a sketch of a mantapam showing two pillars of typical design. Figure 2 is the elevation of a wooden vimánam, showing how readily the stone carving of Southern India lends itself to reproduction in wood. Plate XIII contains sketches of bases and entablatures which find frequent application in the wood work designs made in the School of Arts. Plates XIV and XV are from photographs of two large side-boards recently constructed at the School of Arts. The lower portion corresponds to the pedestal, the frame work upon which it rests being the upana, the cupboards, the cantha or neck, and the mouldings round the side-

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board to the pattica or capota. In large structures it is usual to sub-divide cantha into bays by the insertion of pilasters carved into the form of yális or rearing horses, and advantage has been taken of this to break up the elevation of the bays to form the cupboards and recesses. The upper part of the sideboard in Plate XV is derived from a mantapam with a flush top, and that on Plate XIV from a vimána of a single storey. The main feature of the latter is a central vimána with a subsidiary one on either side. The bases of the pillars on Plate XIV are relieved with carvings of Ganésha, Natarája, Mahakali and Krishna. The central panel of copper repoussé work represents Subrahmanya on his peacock. In the sideboard represented on Plate XV the figures are Sankara, Narayan, Bráhma, and Parthasarathy. In the central vimána Siva, the lord of destruction, rides on his bull in the place of honour, attended on one side by Ganésha astride a bandicoot, and on the other by Subrahmanya mounted on a peacock. In the smaller vimánas the presiding deity is Sri Ráma. The central panel is similar to that on Plate XIII with Vishnu, the protector of the universe, riding on the winged Garuda.

As already stated there are seven orders of pillars, varying from six to twelve diameters in height, from base to capital inclusive. The pillars may be of any shape, circular, square, pentagonal, hexagonal, and so forth. The base is generally square, with sometimes a kalása or water-pot. A nágabandam surmounts this, and carries the pillar, the middle portion of which as a simple ornament called the malaikattu or garland band, or a more ornamental kalása with mango leaves and a cocoanut on it. Surmounting the pillar, and carrying the entablature, is the capital decorated with a series of mouldings similar to those used on the pedestals. In Plate XVII, is a photograph of a lampstand in blackwood, which is a fair example of how an article of modern furniture has been derived from the Hindu orders. The lower part with the projecting yális corresponds to the entablature, and carries the column which corresponds to the base and pillar, and is surmounted by a small table corresponding to the entablature. In Plate XXI is another lampstand, the base being a yáli with mouth turned upwards, from which projects a pillar carrying an entablature. In a modified form this design may be seen in some of the aghandams in temples. In Plate XIX are photographs of a sideboard and cabinet of European form, but with all the ornamental details derived from Dravidian architecture. In Plates XVIII and XX are screens, the framework being of black wood elaborately carved, and the panels of copper repoussé work.

Madura is a noted centre of indigenous art handicraft, which has survived from the days when the town was the chief city of the south of India. Then craftsmen were attracted from far and near, and each brought with him his own peculiar style. In process of time these various styles have become merged into what is now a blend characteristic of the town. This is peculiarly so with the wood-carving, which is celebrated for its boldness of form, due to the influence of the stone-carvers, for its delicate tracery on flat surfaces probably first introduced by men from the Bombay side, for the fine carving of panels decorated with scenes from the legend of the Máhabaratha, and for the excellent modelling of the swámis, which suggests the influence of sandalwood carvers from Mysore and Western India. At the present day the best work is done in the Madura Technical School, an institution maintained by the District Board, which has done much to revive decadent art industries, and, by finding new markets for the productions of the skilled art workmen, has encouraged them to maintain the old high standard of work. Domestic shrines, carved mantapams, sideboards and small tables are the articles now chiefly made in the school, and the majority of them are sold to visitors.

EDGAR THURSTON.

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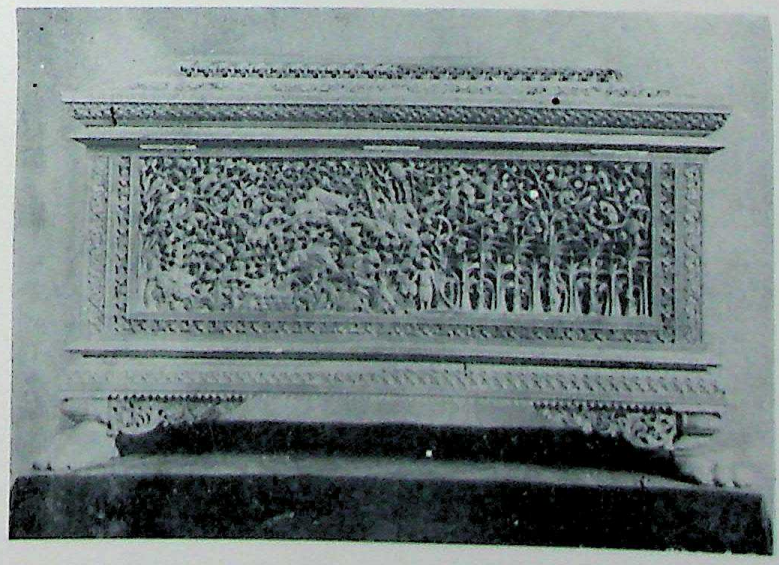

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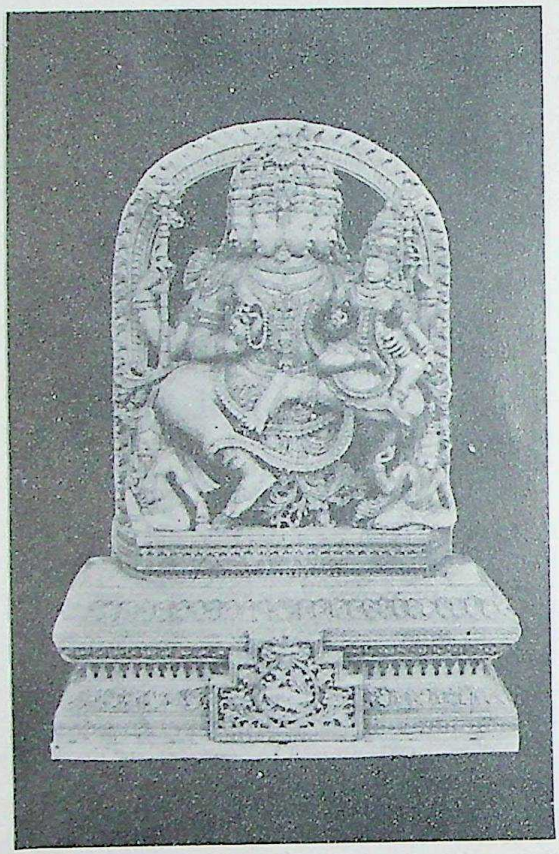

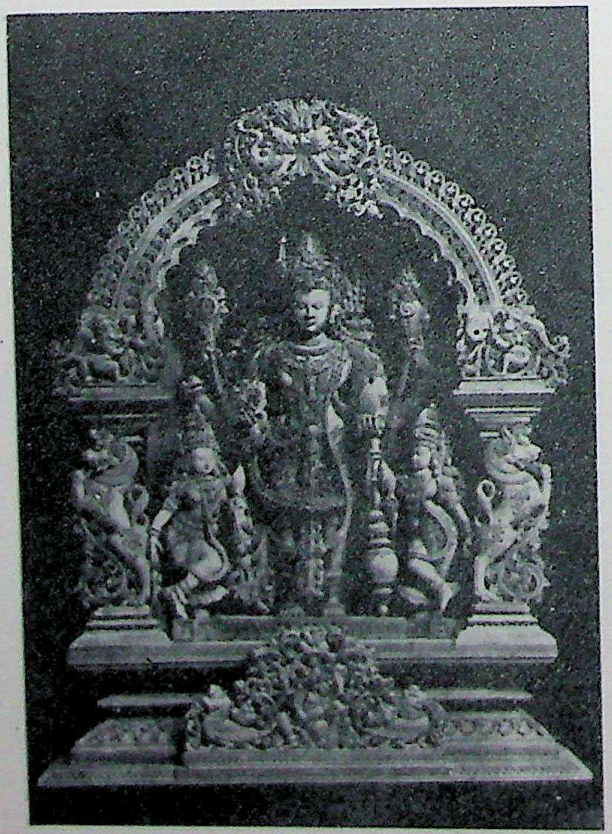

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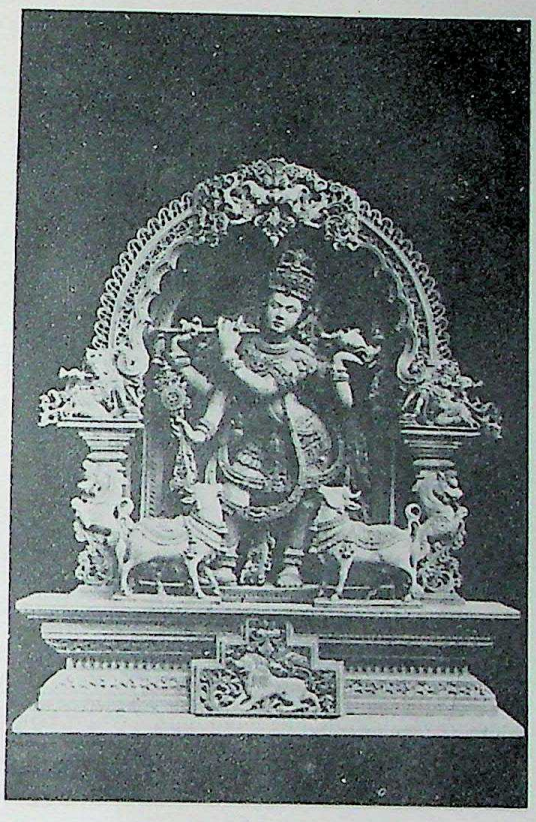

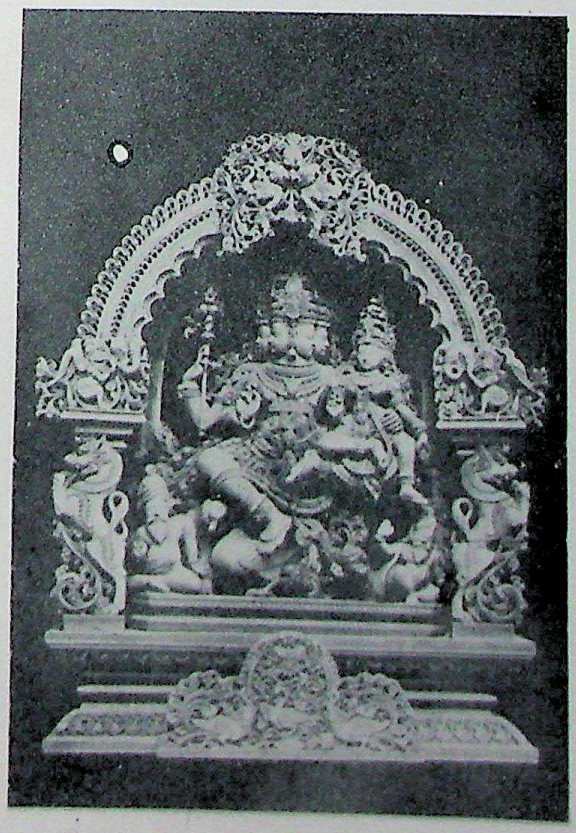

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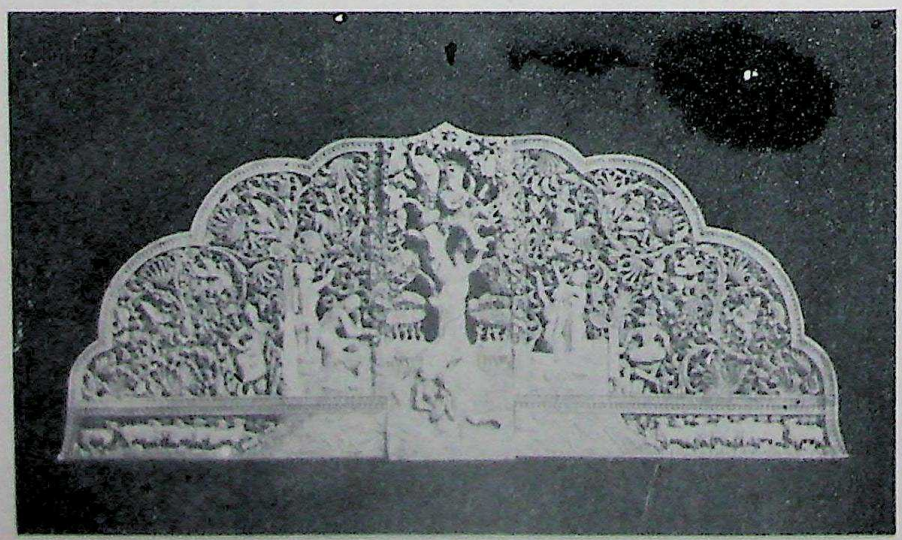

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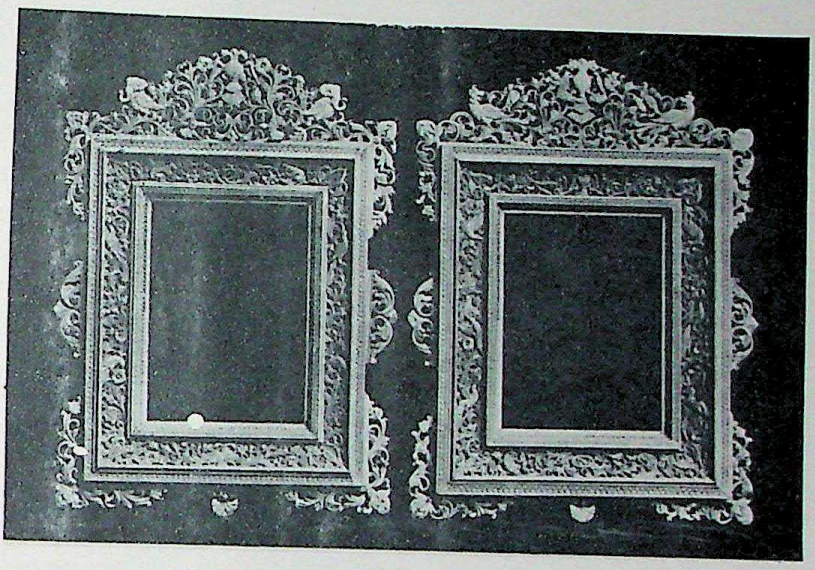

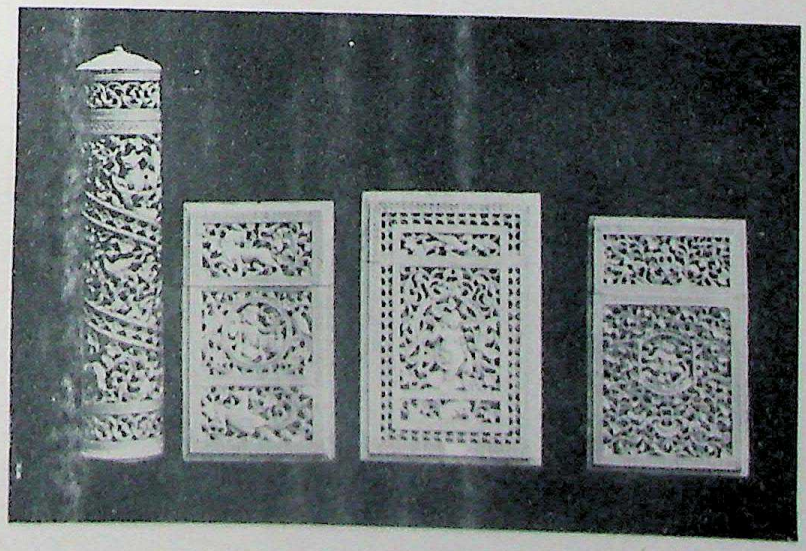

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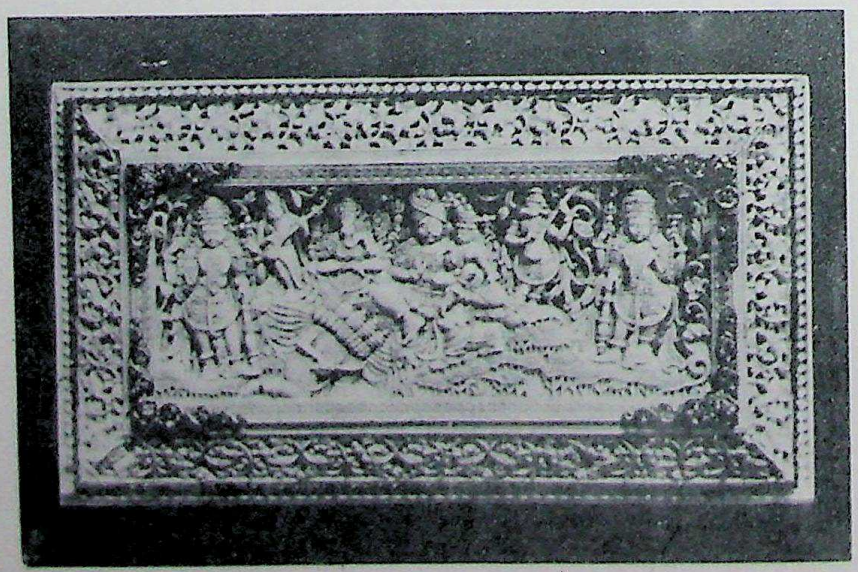

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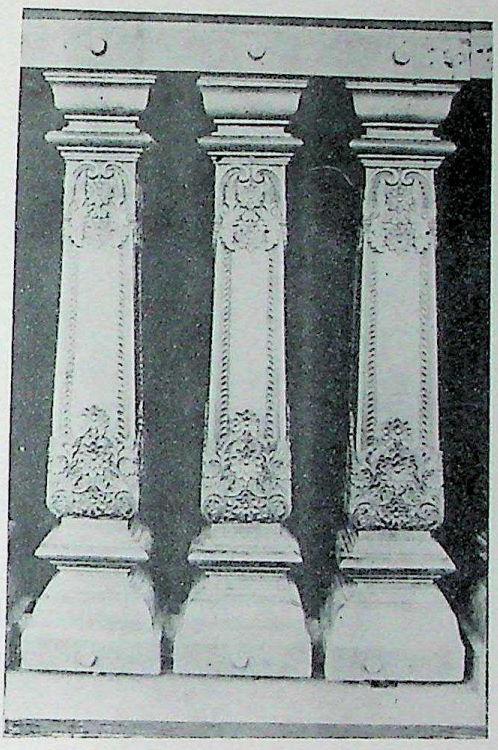

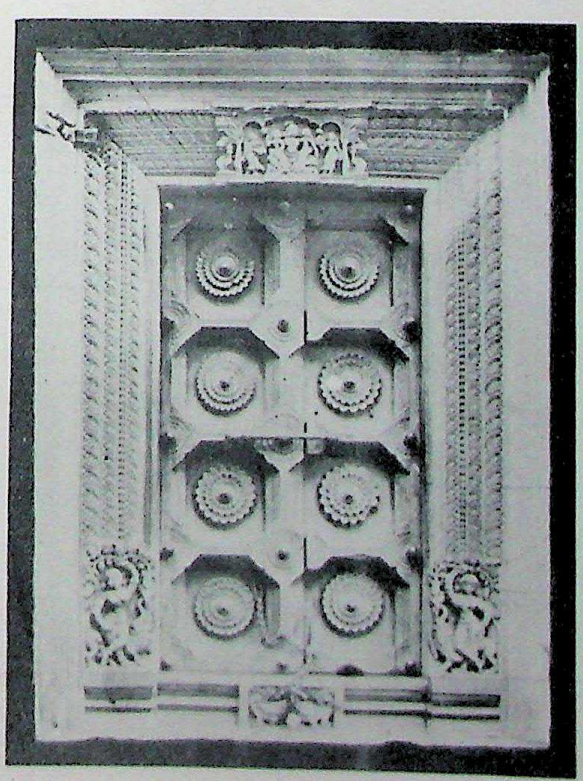

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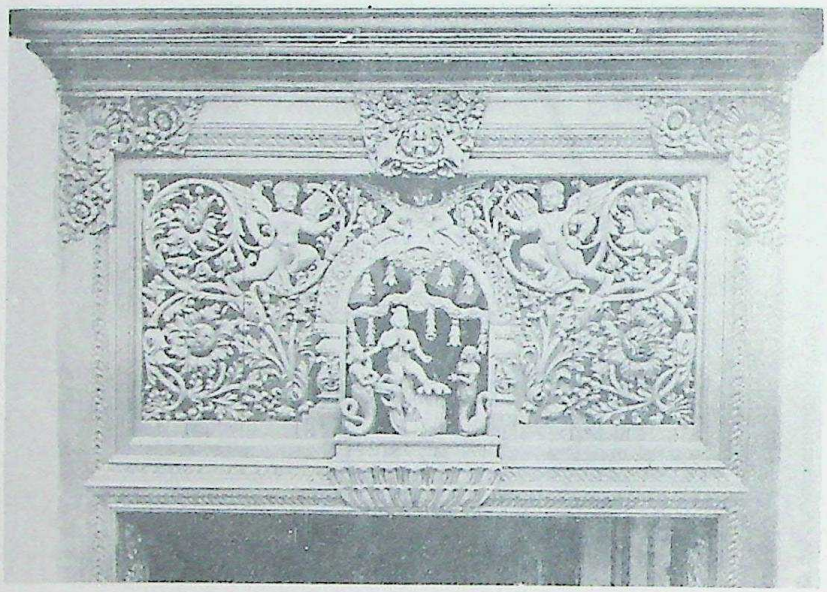

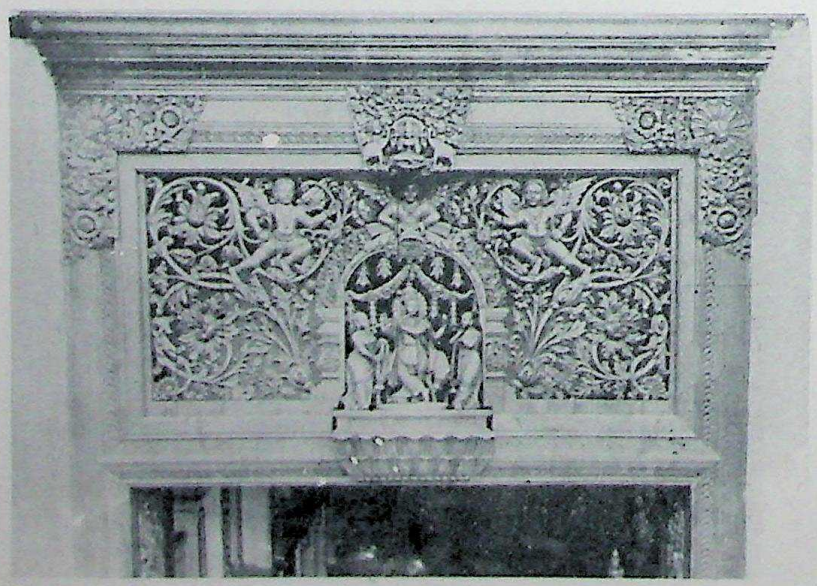

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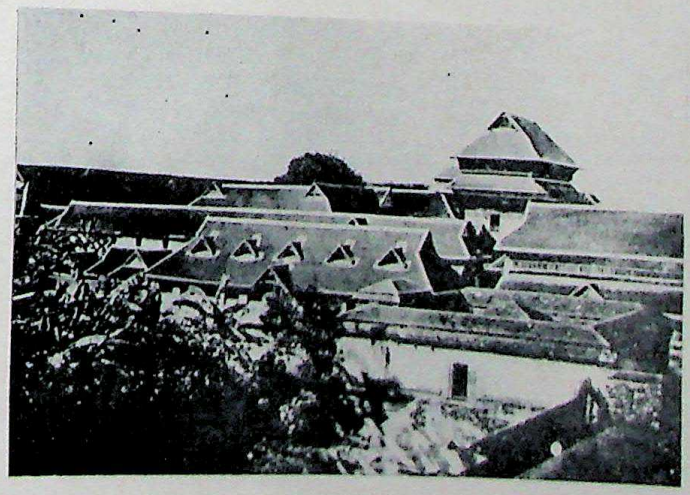

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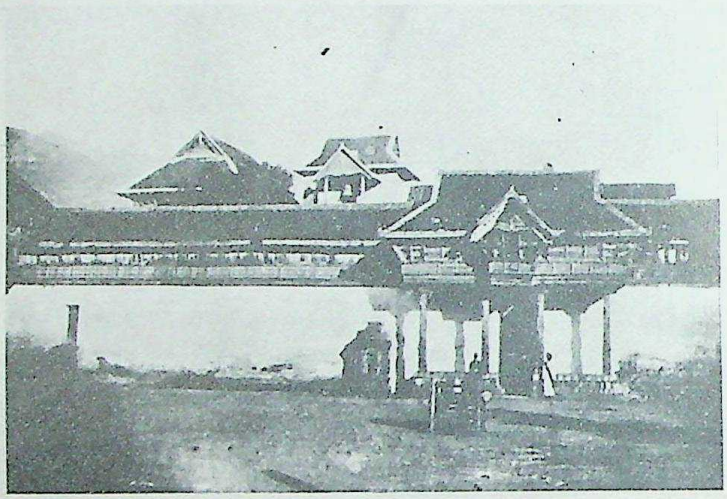

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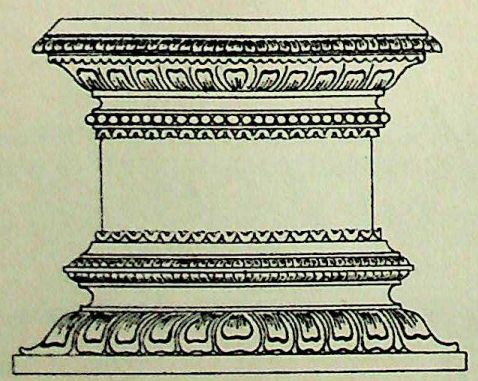

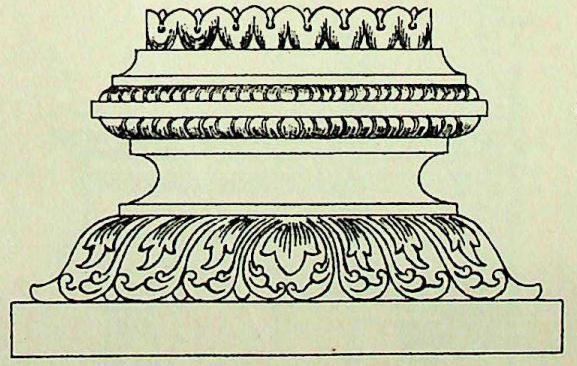

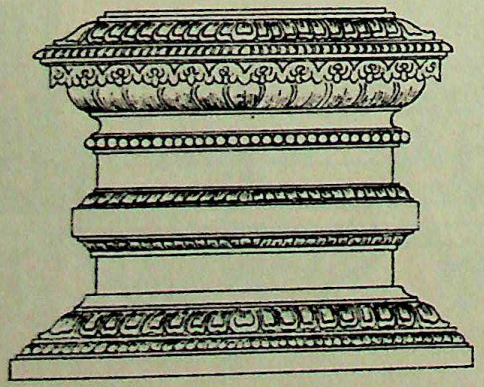

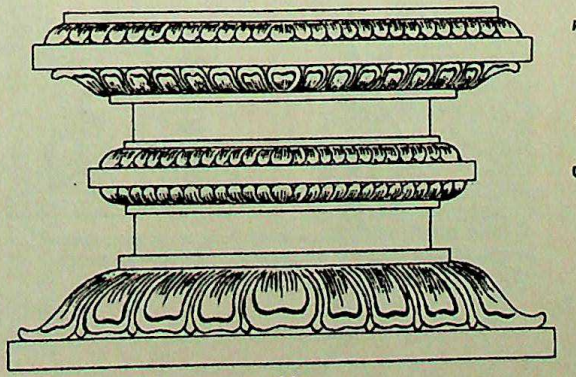

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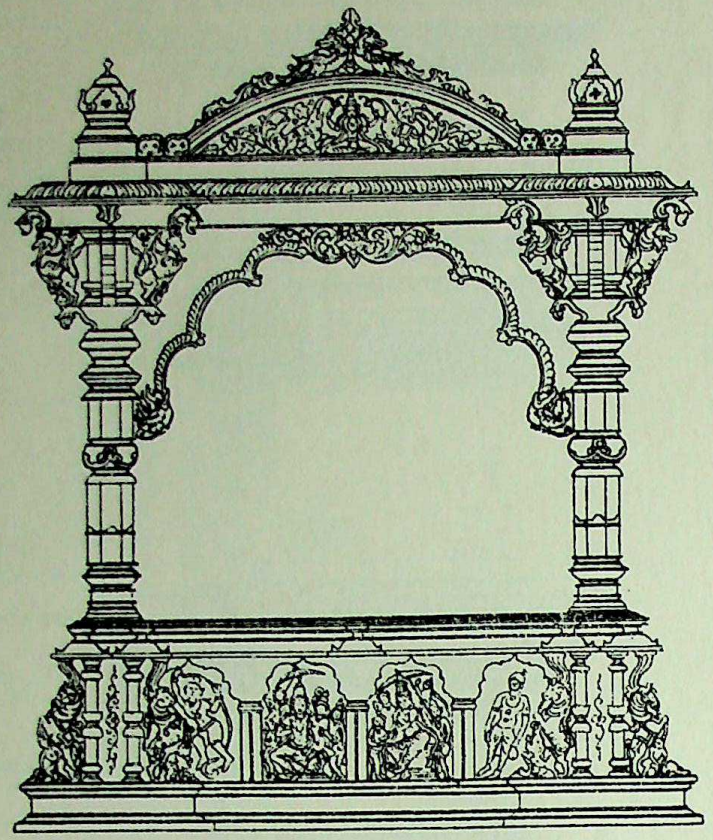

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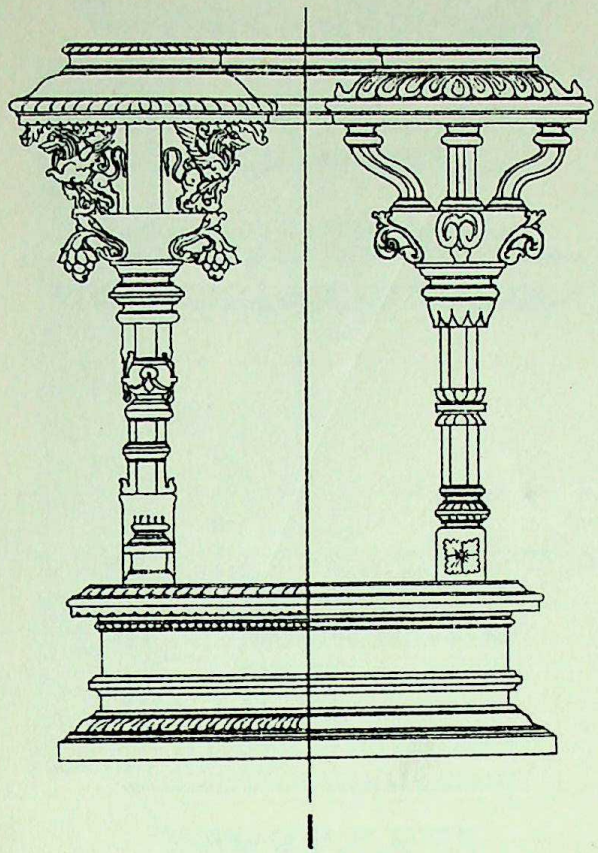

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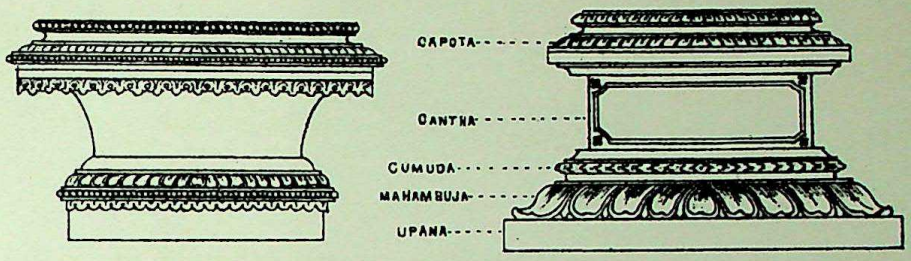
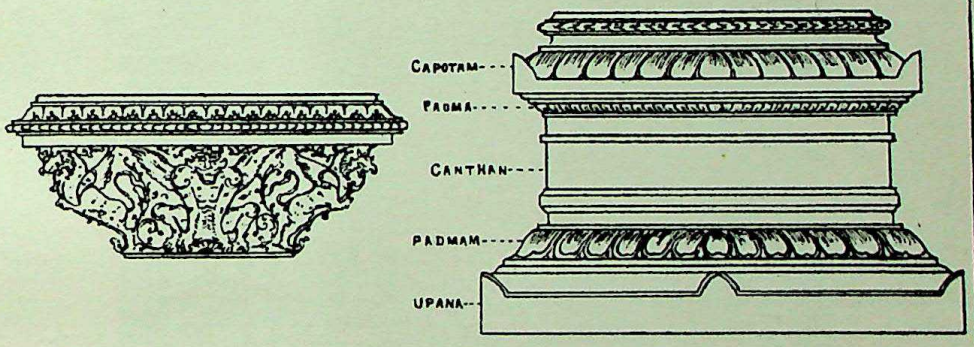
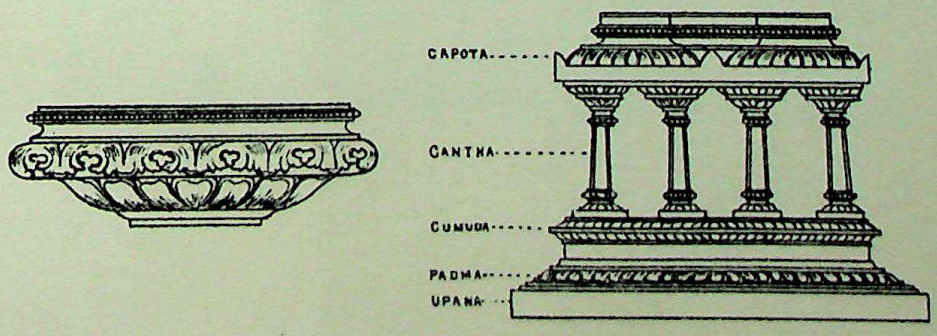
PLATE XIII.







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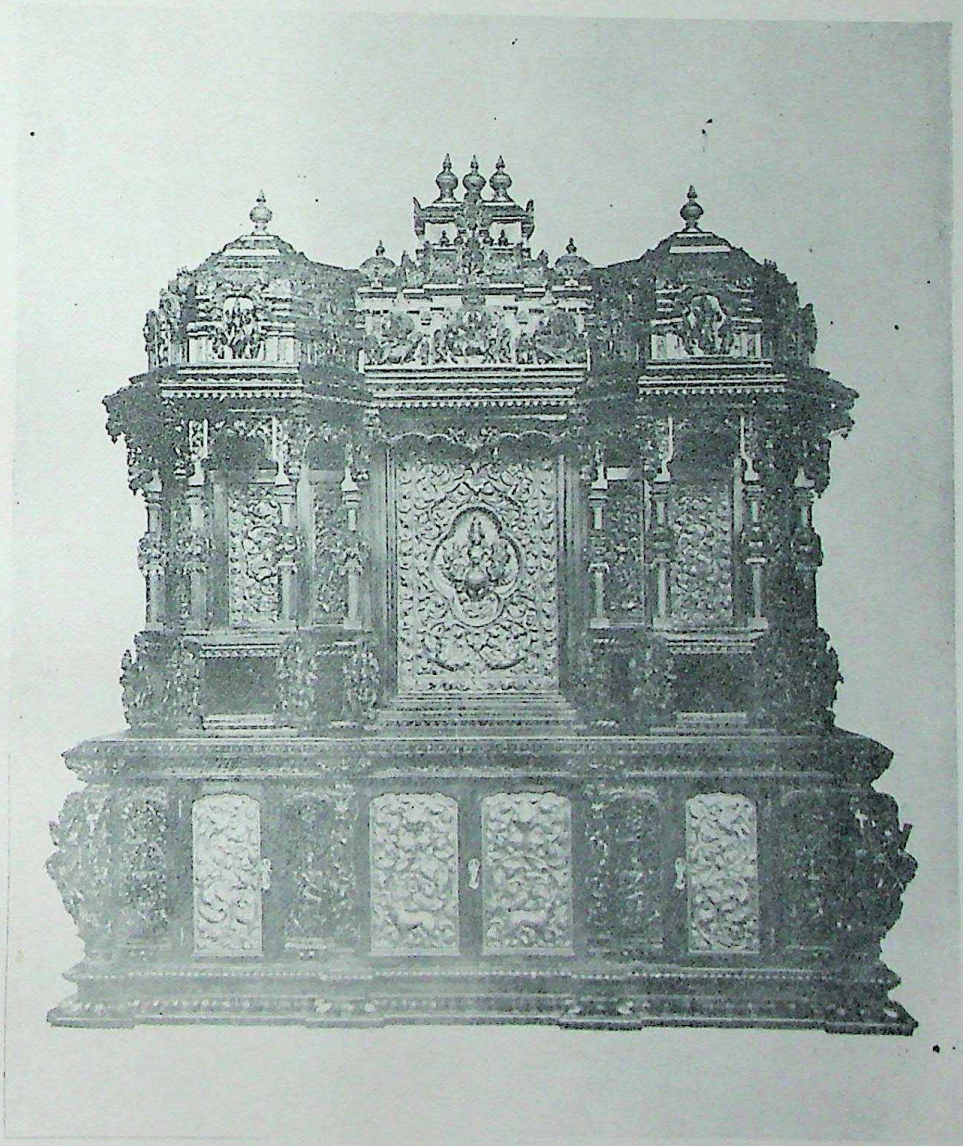

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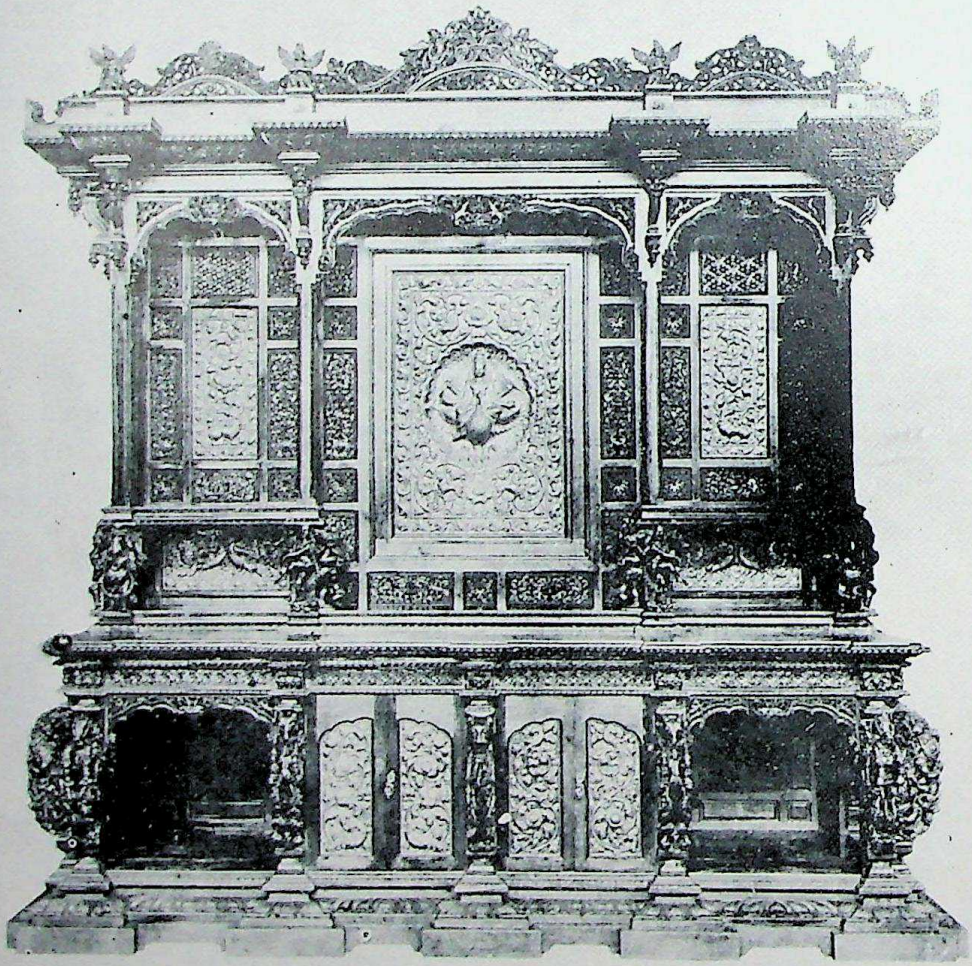

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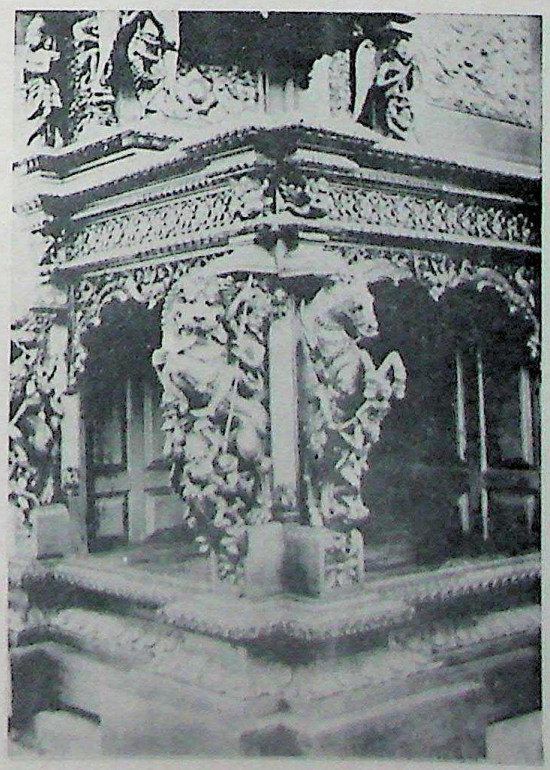

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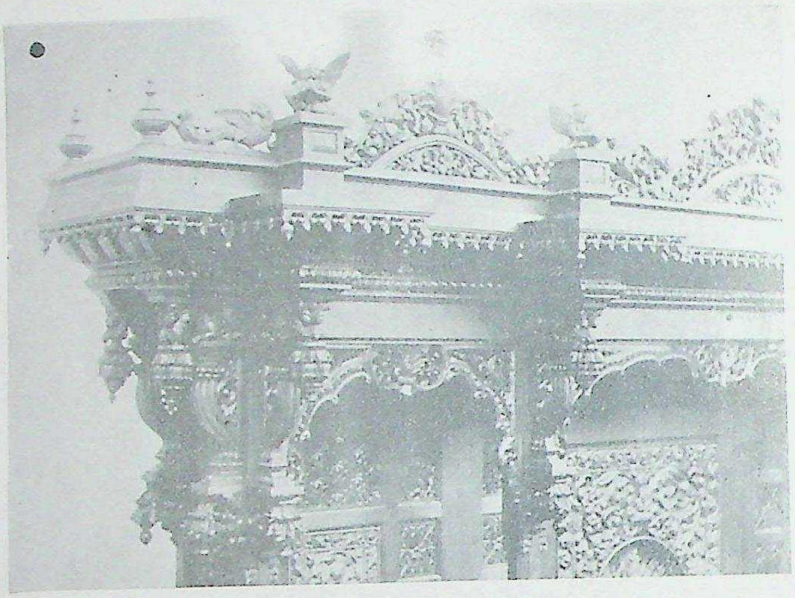

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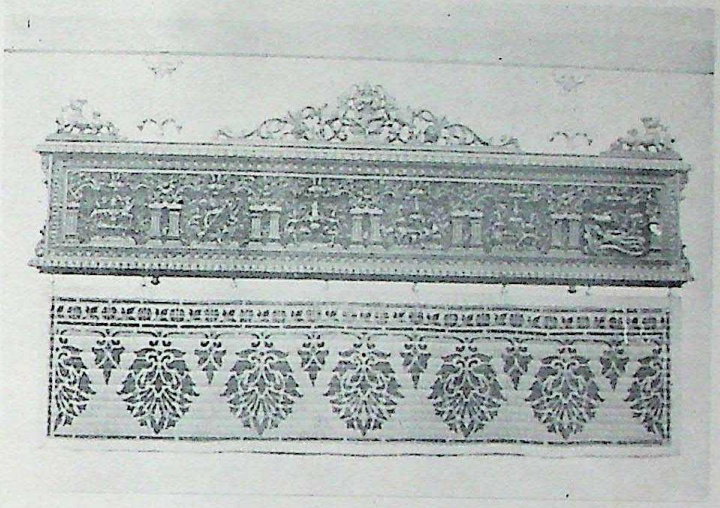

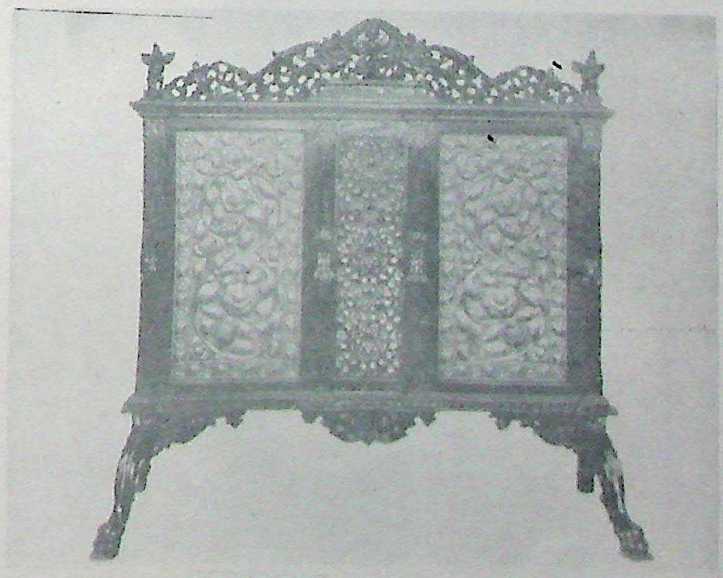

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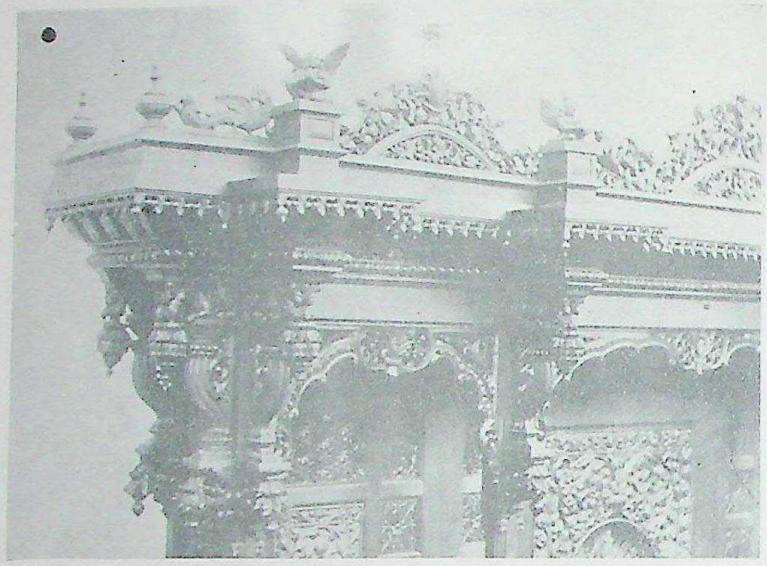

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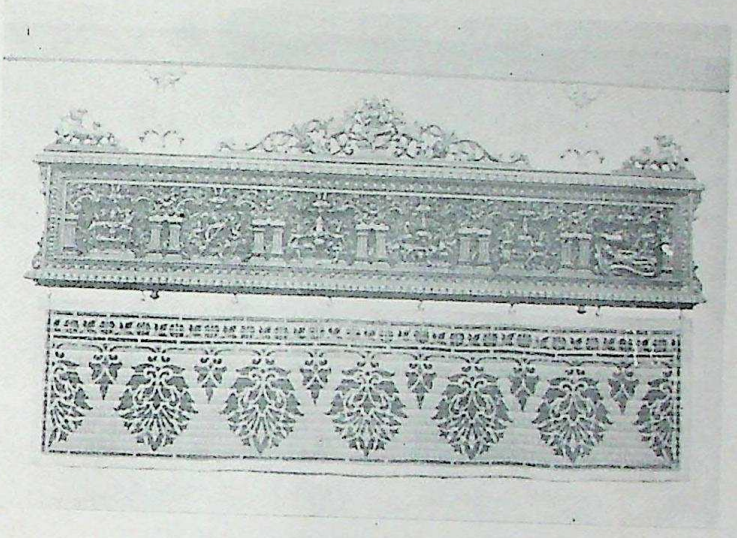

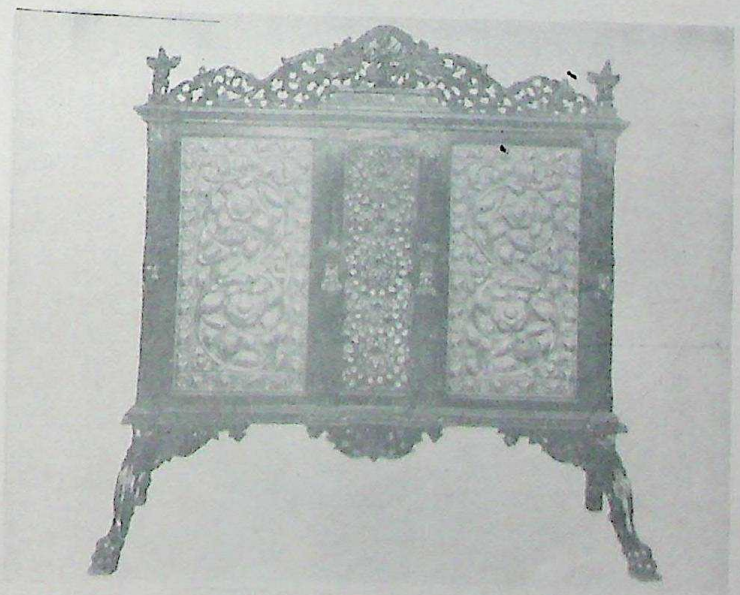

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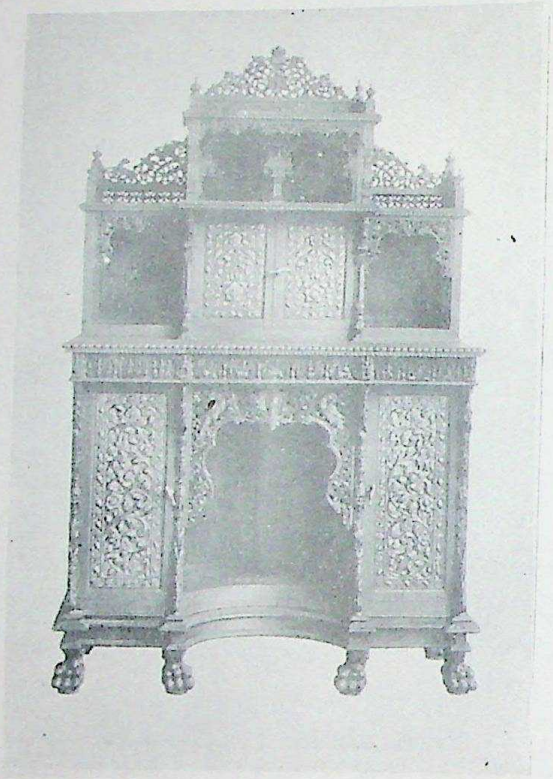

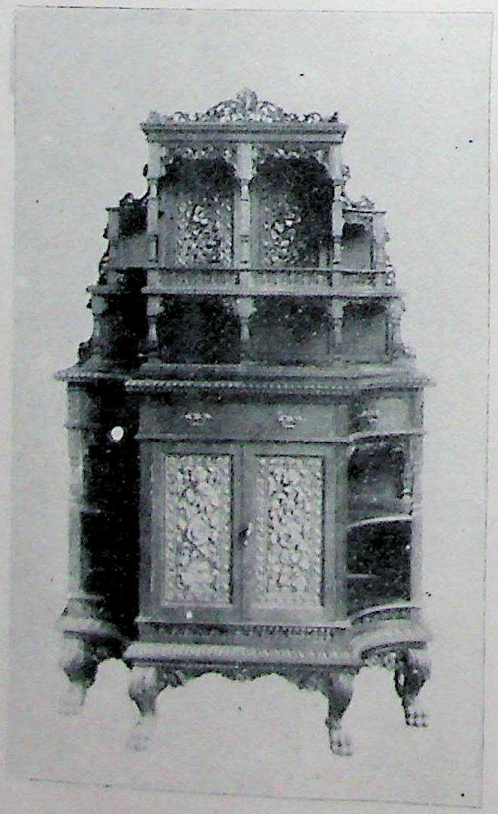

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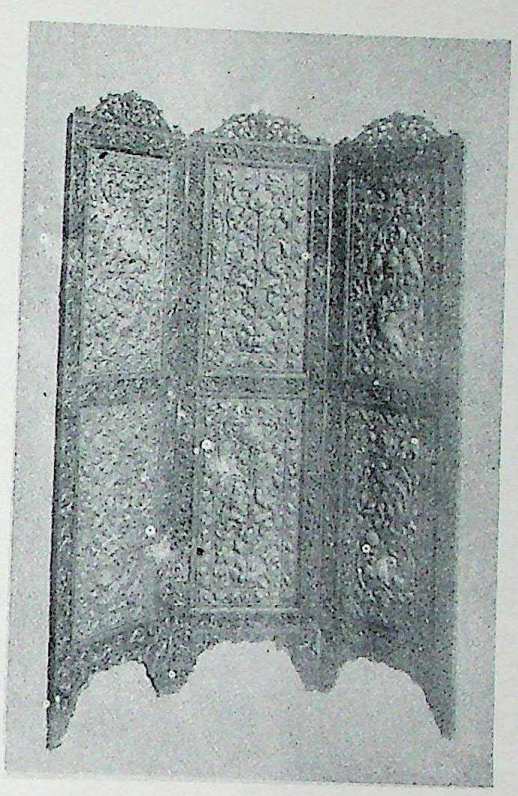

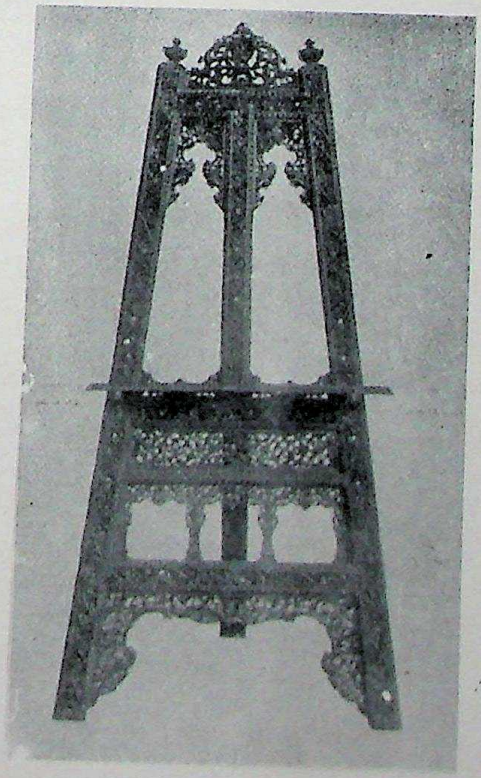

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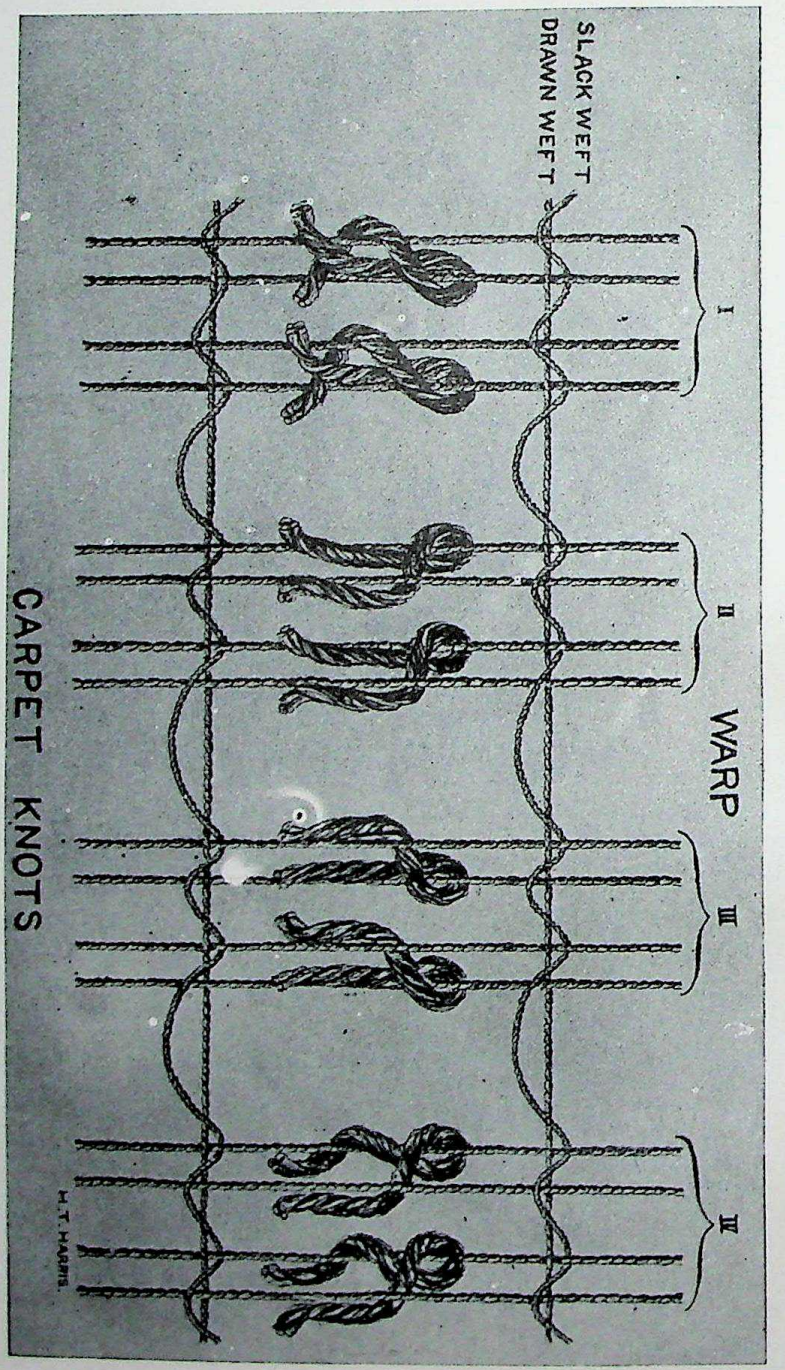

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The Carpet Weaving Industry of Southern India

SOME NOTES ON THE HISTORY OF ORIENTAL CARPETS.

CARPETS date from a very remote period. We read of their being applied to sacred uses by the priests of Heliopolis, and as ornamenting the palaces of the Pharaohs. On state occasions they were placed on the couches of the guests attending royal feasts.

The Bible tells us that the Babylonians were skilled in weaving in divers colours, the designs comprised fabulous animals, and attempts to trace the human form.

Of King Solomon's great temple to the Most High, we read, in the Books of the Kings and the Chronicles, of curtains and veils [purdhas] twined of linen, and blue, and purple, and scarlet, with cherubims of cunning work, wrought with needle work; of wool, of goats' hair, and of rams' skins, dyed red. To-day in Central Asia, Persia and Turkey one often finds carpets in use as hangings in Syrian, Roman, Armenian and Coptic churches, in mosques, and in private residences and public buildings.

An ancient Jewish legend tells us that Naameh, the sister of Tubal Cain and the daughter of Lamech, invented wool-spinning and cloth-weaving. Purple Babylonian carpets are mentioned as having been spread over the grave of Cyrus "the Great."

On the Beni-Hassan rock-tombs in Upper Egypt, which date from about B.C. 2500, are to be found pictures of working weavers. On one of them is a vertical loom; a woman at a distaff is twisting flax or wool into thread with a spindle; near them is the master or head workman superintending the work. Another wall picture shows a man weaving a rug on a horizontal loom. The Nineveh marbles have sculptures of Kurdistani-like rugs in quite modern style, bordered with rosettes and latch-hooks, and bearing the Tree of Life in the centre.

The sacred writings of the Hindus contain frequent references to carpets, but these were probably cotton, silk or wool, woven into what are now known as "Daris," pileless carpets, usually worked upon a horizontal loom.

Pliny writes of the skilled Assyrian weavers, their wonderful colour ideas, and the antiquity of the Art in his time. He tells us that even in his day, the name "Babylonica peristromata" had come to mean "the perfect weaving of a perfect weaver," and a corrupt form of that old name remains to-day with the weavers of the Levant, as the sign and seal of perfect work. Diodorus speaks of the carpets of woven work upon which lay the Egyptian sacred bulls. Homer in the 'Odyssey' tells us of

> "Fair thrones within from space to space were raised,
> Where various carpets with embroidery blazed,
> The work of matrons."*

* Pope's 'Odyssey.'

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Herodotus, Strabo, Æschylus, Plautus, Metellus, Scipio, Horace, Lucan, Flavius Josephus, Arrian, and Athenæus, all frequently mention carpets, and almost every other Greek or Latin author whose work time has spared, tells of this splendid old loom-work. Constantinople was a great seat of the textile industry, and was specially famous for its weaving in wools, which were of great beauty and prized accordingly. The Greeks had carried their own skill in the textile arts to their colony at Byzantium, whither had also drifted the loom and needle work peculiar to India, Persia and China.

From Assyria carpet-weaving found its way to Greece and Rome, and later to Western Europe. Thus right down the ages the loom of conquest and commerce flung its shuttles in "rich caravans and argosies" to and from Imperial Rome, and afterwards Byzantium, for the East remained the fountain head of rich colour and beautiful design, and the home of the textile art.

Abbot Egelric of Croyland, who died A.D. 992, bestowed on his Church two large Pedalia, Pede-cloths or foot cloths [as carpets were then called] "woven with lions," to be laid out before the High Altar on great festivals, and two shorter ones, "trailed over with flowers," for the feast days of the Apostles.

In an old inventory in Exeter Cathedral we find in a list of the bench coverings of the choir, A.D. 1327, this mention of an English-made carpet with a fretted pattern:—"unum tapetum magnum Anglicanum frettatum." Exeter Cathedral had also a carpet, the gift of Bishop Lacy, A.D. 1420, besides two large carpets, one bestowed by Bishop Nevill, A.D. 1456, and another, in chequered pattern, given by Dame Elizabeth Courtenay about the same date.

In the South Kensington Museum is a small, but most unmistakable piece of Hispano-Mauresque carpeting, which Dr. Rock attributes to the late XIV Century. The ground is red, still full of brightness and life; its rich green quatrefoils bear three white animals. The museum also has two pieces of Spanish XVI Century carpets with red grounds, and pomegranate boughs, flowers, and fruit, in blue and yellow, with barbers' pole borders of yellow and red and blue and yellow.

Queen Eleanor of Castile brought into England, in the XIII Century, some of the magnificent rugs woven in Granada and Cordova. They were then known as "Carpets of Baldechino" = Baldechine = Baghdad; probably because the industry was believed to have originated in that city.

Even the bitter warring of the Crusades created in Europe a desire for the luxuries of the Orient as they became known. The Arab carried with him into Southern Europe a new industry, and in Granada and Cordova the Saracen weavers made magnificent carpets both for their Emirs and for trade.

We learn that in the reign of King Edward V, before the throne and the Communion Tables were—

> "Carpets full gay,
> That wrought were in the Orient."

The really interesting narrative of that "God-fearing pirate," Juan Fernandez Pinto, shows how piously and boldly the "Portugalls" of his day [XVI Century] cruised round both coasts of India and the Far East generally, picking up such trifles as inadequately armed ships with their cargoes of cloth, ivory, and spices belonging to the Infidel, and, no doubt, also attended to their own needs in the sacking of ill-guarded towns, and then offered up long prayers of thanksgiving to the Almighty, if they got clean away with whole skins and a valuable haul. Doubtless some of the old South Indian carpets may still be found in the cathedrals, churches and old homes of the rich and noble in Southern Europe, which were got through the exertions of these estimable gentlemen.

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Efforts were made to introduce the Oriental carpet industry into England, in the reign of King Henry VIII, upon the mode of working in vogue in the East, but very little progress seems to have been made until nearly the end of the seventeenth century. This, only partly successful, no doubt led at a much later period to the introduction of the manufacture of English pile or loop carpets, such as those of Axminster, Kidderminster, Glasgow and Wilton.

Later on, at Kelmscott House, Hammersmith, and afterwards at Merton Abbey, Surrey, William Morris commenced the manufacture of carpets upon purely Oriental lines, the designs, his own, being all modifications of some of the best of the old Persian and Indian patterns. The looms of the East never turned out anything more beautiful in colouring, pattern and weave, for the dyers and weavers, inspired by Morris' own energy and art instinct, worked with head and hand, as did the Eastern workers of old time. The dye drugs were, with few exceptions, culled from English fields, and moors and woodlands. Morris never used a large range of colours; he got with a few tints all his effects by skilful arrangement and contrasts. Writing in 1875 he lists "two blues, a blue-green, two greens, two yellows, one brown, a black," "a shade or two of rust yellows or buffs," and says, "with the above I can carry out any design that did not need the madder colours, and setting indigo apart." He re-discovered the "art of weld [*Reseda luteola*]; dyeing, the ancientist of yellow dyes and the fastest" and several of the reintroduced pastel dye colours are due to him.

In his essay, 'Dyeing as an Art,' Morris tells of his struggles after the old colourings. Pliny shewed him old methods; such books as Gerard's Old English Herbal, Fuchsius [Basle 1543], Mathiolus [Venice 1590], Hellot's Wool Dyeing [Paris 1750] were among his tutors for dye-stuffs and methods; and Mr. George Wardle, speaking of his work at that time [1875], says, "I do not think a single dyeing went wrong, nor was any appreciable quantity of yarn wasted." The "Morris" factory still exists at Merton Abbey, and turns out some excellent work, both hand-loom and power, but little, I fear, equal to that produced during Morris' own time.

Excellent hand-loom carpets are now made in Scotland and Ireland. Much of the dyeing of these is done with locally grown vegetable dye stuffs, but in some that I have seen "the mark of the beast" aniline is plainly in evidence.

CARPET WEAVING IN SOUTH INDIA.

"They make likewise excellent carpets of their wools in fine mingled colours, some of them more than three yards broad, and of a great length. Some other richer carpets they make all of silk, or of silk and wool, so artificially mixed that they lively represent those flowers and figures made in them. The grounds of some other of their very rich carpets are in silver and gold, about which are such silken flowers and figures as before I named, most excellently and orderly dispos'd throughout the whole work."—'A Voyage to East India' by the Reverend Edward Terry [Chaplain to Sir Thomas Roe, Ambassador to the great Moghul], 1615–17. *London*, 1655.

Sir George Birdwood asserts, with apparent good reason, that the manufacture of pile carpets was probably introduced into India by the Saracens. The authentic history of the Carpet Industry in South India commences in 1679, and proves fairly conclusively that the art came from Persia more than a hundred years previously I extract the following from, "A Memoriall of Streynsham Master Esquire, Agent of the Coast and Bay

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of Bengall, his journey from Fort Saint George—Madraspatnam, to Metchlepatam and parts, to visit those factorys, &c., 1676-79":—

"*March 14th*, 1679.—The Agent, &c., went to visit the Dutch at Pollicull this evening which is about 7 miles inland from Madapollam, there the Dutch have a Factory of a large compound, where they dye much blew cloth, having above 300 jars set in the ground; for that worke also they make many of their best paintings there." [Undoubtedly Coromandel chintz cloths, of which Bernier writes in 1663, "Cloths painted by a pencil of Masulipatam, wrought and contrived with such vivid colours and flowers, so naturally drawn, that one would have said it was a parterre."—H. T. H.]

"*March 19th*, 1679.—We sett forward early in the night and by 9 or 10 in the morning come to Elloor three gentue leagues, this Elloor is reckoned one of the greatest Townes in this country, your King in his last progress coming to see it, [Abū'l Hassan Shāh, last of the Qutb Shāhī Dynasty of Golconda. He visited Masulipatam on the 17th of January 1676.—H. T. H.] where are made your best Carpetts, after the manner of those in Persia, by a race of Persians, which they told me came over above 100 yeares ago, the manner of making them we saw, and is in brief thus; the loome is streached right up and downe made of Cotton thread and the Carpett wrought upon them with the woollen yarne of severall collours by young boyes of 8 to 14 yeares old, a man with the Patterne of the worke drawne upon paper standing at the back side of the Carpett, and directing the boyes that worke it, how much of each collour of yarne should be wrought in and every thread being wrought they share it with a pair of sizors and then proceed to the next."

This appears to me to be quite satisfactory evidence that carpet weaving was being carried on at Ellore so far back as about 1550, and Orme mentions a tradition that Masulipatam was founded in the fourteenth century by a number of Arabs, who arrived on the coast accompanied by their wives and families.* Orme also tells us that "the city is, even at this day, a place of considerable trade and resort, and famous for its manufactures of painted cloths; for the plants from which the dyes are extracted grow nowhere in such perfection as in the adjacent territory." The first mention of Masulipatam in history is a sanction to Arabs to build a mosque, which was granted by the tolerant Carnatic Rajahs about 1425 A.D.

We may assume therefore with some reason that the industries in Ellore and Masulipatam actually date from about the middle of the fifteenth century, although Streynsham Master makes no mention of the industry in his "Memoriall" when writing of Masulipatam.

Baldæus, in his book, "A description of Ye East Indian Coastes of Malabar, and Coromandell." *Amsterdam*, 1672, speaks of the City of Masulipatam as "very populous" and tells of "the large English and Dutch Factories" there, he also says, "The Governour pays a certain tribute to the King of Golconda, which he squeezes out of the inhabitants especially the *Gentues*, who are sorely oppress'd by the Persians and Moors, who farme all the weaving trade from the Great Patrons." This note on Masulipatam appears to have been written about 1636.

Baldæus thus mentions Chay root.—"Esaye Root is a small root no bigger than a little sprig, of about a span in length, used by the Dyers. The way to test its goodness is to break it into pieces, and to see if it be very red within, or else to chaw a piece of it, and if you perseive a nitrous taste it is good." Dr. Fryer, 1672-81, says, "The roots from Petaipouli [? Nizámapatam] on the dyed and painted stuffs exceed even those of Masulipatam. The collour thereof is so deep that they are obliged to use it with the Esaye of Aricall [? Arikatla] and Ortacour, to make it the more lively."

* Kistna District Manual, 1883.

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AYYAMPET IN THE TANJORE DISTRICT,—we know little more of the history of carpet weaving there than that it was, in the Hon'ble Company's time, the centre of the rug industry for which the district was once famous. Mr. E. B. Havell, in his report 1885–88, tells us that "ten years ago 107 families were employed in the industry, now 12 families only are employed in it."

Ayyampet has always been noted for its silk carpets, and it is not so very long ago that the export of them touched over a lakh of rupees annually. There is no doubt that this industry is now almost dead, and it is doubtful whether there are any men left who possess the old dye secrets. The few modern silk carpets made at Ayyampet which I have seen were very coarse, not more than 6 or 7 stitches to the inch, and, with the exception of the blues, were all dyed in aniline colours, and these were by no means skilfully applied. The Tanjore District Gazetteer, 1906, says of the Ayyampet carpets that:—"the cheaper jail-made woollen rugs have destroyed the industry there, woollen carpets are rarely made, and silk ones never except to order. Both are excellent in quality, especially the latter, but the colour combinations are not always pleasing. The warp is of thick cotton thread, and the woof usually of aloe fibre for woollen, and cotton for silk carpets. A woollen carpet six feet by three feet costs Rs. 7, and a silk one of the same dimensions, which takes three times as long [viz., one month] to make, costs Rs. 44."

Mr. E. B. Havell says of the Ayyampet carpets, as he knew them in 1885–88:—"The patterns and colour of the carpets now made are not so good as those to be found in old carpets, but this is probably the effect rather than the cause of the decline in prosperity. These carpets do not appear to have found much favour in the European market. The pattern and colours, which are very bold and striking, do not suit the taste of the many, who in their painful anxiety to eschew anything vulgar, or in bad taste, fall back on so-called 'æsthetic' muddiness of colour and monotony of patterns."

"At the neighbouring inam village of Manojiappachavadi a few weavers make a coarser kind of woollen carpet"—'District Manual,' 1906. This industry appears to have absolutely died out.

BANGALORE.—The carpet industry in the Mysore State is said to have been started by Haidar Ali, with some weavers who were got from Golconda, Bijapur, and North India, about a hundred and fifty years ago. But in Buchanan's 'Journey through Mysore,' 1807, there is no mention of carpet-weaving, although he apparently deals exhaustively with the dyeing, weaving and sale of the textiles then made in the Province. The tables of exports show that, in fasli 1203, the value of carpets exported was only a little over five pagodas. There are in the city of Bangalore a few families that migrated there about twenty years ago from Ellore. All the families of the poorer weavers work at their trade; the few master-workmen, who are better off, employ only men and boys.

Aniline colours are exclusively used for low-grade carpets; in the better qualities both aniline and vegetable dyes are used. Indigo dyeing is done in the bazaar by professional dyers, and never by the carpet-makers themselves.

There is little demand in the Bangalore bazaar for pile carpets, most of those made being woollen daris on a mill-twist foundation, the designs of which are quite simple and rarely of any artistic merit.

The Bangalore Jail has had a reputation for many years for the production of carpets in good weave, soft attractive colouring, and in many excellent old patterns. It is most unfortunate, therefore, to note that a number of the colours now used are aniline, and it is to be hoped that the stigma which thus attaches to the carpet industry in the jail will soon be removed.

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THE CENTRAL JAIL AT COIMBATORE weaves carpets of wool, cotton, aloe and other fibres. One peculiarity of the woollen carpets from there, which I have seen, is that the colours look more suited for cotton than for a woollen pile fabric.

ELLORE [GÓDÁVARI DISTRICT] lies low between the deltas of the Gódávari and Kistna. It has, as we have already seen, been the principal seat of the carpet industry in this Presidency for several centuries. The industry is carried on in the town itself, and in the adjacent suburbs of Sannivarapettah and Tangallamoodi.

Writing in 1852 of the exhibits sent to the great Exhibition of 1851, Dr. Forbes Royle says:—"The rugs from Ellore were universally admired for their general characteristics of beautiful Oriental pattern, fine weave, and rich artistic colouring; these seem well adapted to find ready sale in Europe." And Sir George Birdwood in 'The Industrial Arts of India,' 1880, tells us that:—"these, which are known in the London market by the name of *Coconada*, the place of their shipment on the Coromandel Coast to Madras, prove that carpets of uncontaminated native designs and integrity of quality are still made by the weavers of India, but of varieties not yet generally recognized by huckstering European dealers, and obtained from villages far away from English stations and railway lines. They are equal to anything ever produced in the Dekkan. The colours are now perhaps a little more brilliant than was observable in the memorable examples from the same district shown in the Exhibition of 1851, now in the India Museum; but this brilliance is really due rather to want of age, for the details have, in a high degree, all the varied play of colour and charm of pattern of the older carpets, and time only is required to mellow them to perfection. Two of these Coconada or Madras rugs have been sent to the South Kensington Museum by Mr. Vincent Robinson; one is of a very distinctive pattern, and perhaps the most beautiful known of this variety of Indian carpets. Their weavers are Muhamedan descendants of Persian settlers." [Both are entirely beautiful, and no such carpets are now made on the coast, probably not in India—H. T. H.]

There were a few Ellore carpets of very ordinary pattern and weave at the Madras Industrial and Arts Exhibition, 1903, and in my report upon that Exhibition I had occasion to say:—"The exhibits of carpets sent from Ellore were poor in conception, weave and colour; and a visit paid to that station by the writer a few months ago satisfied him that no single word of Sir George Birdwood's and Dr. Royle's lavish praise can now be applied to the industry. The patterns in use were poor, and often modifications of cheap Wilton, Kidderminster, and German power-loom designs. Some of the old patterns are still with the weavers, but unfortunately there is no trade demand for this fine class of goods, the old dyes are being forgotten, and have given place to cheap anilines unskilfully applied." The panel on the title page of this book illustrates one of the oldest and best of the old Ellore borders, which doubtless came over, originally, with early settlers from Persia. It is a perfect setting for the "Aushan Khany" pattern.

Every Ellore carpet that I have seen since 1903 confirms the opinion I then formed, and, as I understand that several of the best of the old weaver-dyers are dead, it is much to be feared that many of the secrets of the Art have passed away with them. The dyeing profession has always been more or less conservative and hereditary, and has rarely been adoptive, unless the dyer, having no son, has occasionally adopted a nephew or the son of some relative or intimate friend. Almost everywhere in the East dyeing has been a trade brotherhood, in which the effort of each has been to show better results than his neighbour, and in which the bond and the creed have been reverence for the colour secrets. The old dyer's great fear has always been that his neighbour rival will, by trickery or craft, get at his secrets, and these have almost covered the whole field of vegetable life. He never was a chemist, as we moderns understand the chemistry of colour, his dyeing was all rule o'thumb

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work, if you choose to call it so, but he got fast colour results, which were at once the joy and the envy of his employers and fellow workers. To-day this art has gone, never I fear to return, and in place of it we have the cheap, crude, harsh dyes from the German chemical factories with their garish tones.

Mr. E. B. Havell writing in 1885–88 says:—"the native demand is confined to small mats or rugs, but large carpets are made for European firms. The patterns are bold in character, of a floral type generally. The dyes in use are all native and prepared by the weavers themselves, and *I did not discover any in which aniline dyes were used*, but probably they may be found in some of the inferior small rugs, as is the case at Ayyampet, at Tanjore. The dyes most used are for crimson or red, stick lac and sappan wood [*Cæsalpina Sappan*]. Yellow, allikaya and turmeric. Orange or reddish yellow, the flowers of the moduga tree [*Butea frondosa*] combined with turmeric. Dark and pale blue, indigo. And other colours are produced by the combination of the above."

"The ordinary Ellore and Masulipatam carpets of small size prepared for the country bazaars are often of inferior stuff and badly made, but carpets of the superior class prepared only on special orders are equal in point of finish and material, and infinitely superior artistically, to the imitations of them made in the various jails of the Presidency. There may be a falling off in treatment of colour, and in the execution in the details in pattern compared with the finish in the working of Indian carpets made twenty or thirty years ago. The best patterns in use are not inferior to those of old South Indian carpets, which are held up to the disparagement of modern productions. Aniline dyes are very rarely used, as they are at Warangal and other places in Hyderabad. And I have seen carpets from the native looms at the three seats of the industry—Ellore, Masulipatam and Ayyampet—which are in no respect inferior to old specimens in the hands of connoisseurs in London, or in native houses and palaces."

It is quite clear, unfortunately, that Mr. Havell's words of commendation cannot now be applied to carpets woven in Ellore or the other two centres to which he refers.

The master weavers of Ellore have some old pattern pieces in distinctly uncommon old designs; it would be worth while getting them to copy the best of these in ten-stitch quality and in vegetable dyeing. Some of them are very old and faded, all are good.

Further information about the Ellore carpet industry will be found in the notes by Mr. Alfred Chatterton, B.Sc., and Messrs. Wilson & Co. of Madras.

In Madras City carpet weaving is of comparatively recent introduction, and the industry has never attained anything like large proportions.

The School of Arts has a few looms, and uses principally soft "mill-spun" wool from Cawnpore. The dyes used are vegetable, indigo dyeing being done in the bazaar. The school is, like the Jail Department, in possession of a copy of the magnificent 'Vienna Carpet Book,' illustrating in delicate colouring some of the best specimens of the old carpets of the East.

The Anjuman school workshop has a few looms. All dyeing is done on the premises by a Hindu, who has learnt most of his dyeing from the writer. Synthetic indigo is the only imported dye-drug that is used in the school. The Anjuman has a number of water colour and tempera drawings of good old Persian and North India designs.

Kaja Hussain Sahib, an ex-scholar and carpet maistri of the Anjuman, has a small factory. His trade is principally the manufacture of cheap low grade rugs dyed with anilines for export and local trade, but he is undoubtedly able to turn out a really good carpet in vegetable dyes if this be insisted on, and a decent price paid. There are one or two very small workers in the bazaar, whose make calls for no comment.

Masulipatam in the Kistna District has probably been connected with the carpet-weaving industry as long as Ellore.

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There is no doubt that the Hon'ble East India Company was shipping carpets from this place at the end of the XVII Century. The industry appears to have been in a state of decay for many years, and, with few exceptions, carpets from thence are of very inferior weave and colour. Even the blues were aniline in a number which I had an opportunity of seeing a short time ago.

Sir George Birdwood, in his 'Industrial Arts of India' says:—"The carpets of Masulipatam were formerly amongst the finest produced in India," and, complaining bitterly of the deteriorating influence of English indentors upon the industry, he concludes his note by saying "these glorious carpets of Masulipatam have sunk to a mockery and travestie of their former selves."

I have been able to secure very little information from Masulipatam regarding the present condition of the industry there, but it may be assumed generally that its circumstances are much the same as those of the trade in Ellore.

THE RAJAHMUNDRY JAIL makes a few woollen, cotton and other fibre carpets. Some of the colours in use are excellent; others, unfortunately, appear to be anilines.

RANJANGUDI IN THE TRICHINOPOLY DISTRICT had a reputation for cotton pile carpets. The colouring and design have been described as very excellent. The industry appears, however, to have died out altogether.

THE TANJORE JAIL has a small selection of good carpet patterns. I have never had an opportunity of seeing any of the work turned out there.

THE VELLORE CENTRAL JAIL [NORTH ARCOT DISTRICT] has an old established and well deserved reputation for fine woollen pile carpets. There is in the jail an excellent selection of old pattern pieces, a collection of which might—together with some from Ellore, and, possibly, Masulipatam—well be copied and exhibited in the Madras Museum, which has at present only six small squares illustrating Ellore designs, and a coarse Ayyampet silk rug. A few years ago the mistake was made of introducing aniline colours into the carpet work of this jail. The error was soon discovered, and promptly stopped. The reader is referred for further information regarding the work in this jail to the very interesting note which has been submitted by the Superintendent, Mr. G. Cloney.

WALAJANAGAR [NORTH ARCOT DISTRICT] is an old seat of the carpet industry. The few weavers remaining there say that they were brought from Bunder (Masulipatam) by the Nawábs of the Carnatic about 150 years ago. A few looms are employed in weaving rugs, which are miserably poor in pattern and colour, a little better perhaps than the commonest of the Bangalore and Ellore weaves. On my visit there last year I was told that several silk carpets in twelve and ten stitch qualities were being woven, and that the dyeing was all aniline except the blues and yellows. I was unable, however, to get to see them. The few weavers I saw told me that the trade was dead, and that all who could were giving it up, and taking to other means of livelihood.

MALABAR DISTRICT.—There are now no carpets of any kind made in this District, and it is a strange fact that all traces of the old Malabar carpets [sometimes called "Coast" or "Zamorin" carpets], of the XV, XVI and early XVII Century, have been lost. The enquiries made by the Collector of Malabar, the Resident in Travancore and Cochin, and others, prove that there are apparently none now in existence anywhere on the West Coast.

Baldæus, "Minister of God's word in Ceylon," in his interesting 'Description of Ye East-India coastes of Malabar and Coromandel,' *Amsterdam*, 1672, writes thus regarding Vasco de Gama's visit to the "Sammoryn of Calecutt," 1607, at Parrane [? Ponnani]. "The floor and walls of the hall were spread with Carpetts of tapestry and silk and gold," and, "The Sammoryn was seated upon an *Alkatif* or Carpett."

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John Huygen Van Linschoten, in his —'Voyage to the East Indies,' 1583–89, Trans. *London*, 1598, [Hakluyt Socy.], says of the weddings of all well to do people in Goa,—"the neighbours and nearest friends lie on rich Indian carpets in the windowes, and throw Rose Water upon the Bryde and Bridegroome."—This and the foregoing quotation go, I think, to show that Indian carpets were in fairly common use on the West Coast. But there is no evidence whatever, in any of the authorities I have consulted, to prove that carpets were ever made on or near the Malabar Coast.

It seems likely that the "Zamorin" carpets were woven in the Deccan, the Balaghat, in Central India, or at Ayyampett, Ellore or Masulipatam, and probably to the special instructions of those for whom they were manufactured. And it is on record that carpets and rugs [*alkatif*] were often brought to Calicut and Goa, by traders from the Persian Gulf and Red Sea. There is no doubt that the 'Zamorin' carpets were in altogether special designs, quite different from any other makes now known in India, except perhaps some of the Multan and Tanjore-Ayyampett bird and animal patterns, and it is, I think, a reasonable assumption that these special 'coast pattern' carpets, were made for people on the Malabar Coast at some fairly distant carpet weaving centre.

These were the only woollen pile carpets made from pure Hindu designs, and free from European or Saracenic influences. Sir George Birdwood, writing so recently as 1879, says of this class of carpet:—"No other manufacturers of carpets known could hold a pattern together with such a scheme of colouring and scale of design. The simplicity and felicity shown in putting the right amount of colour and exact force of pattern, suited to the position given them, are wonderful and quite unapproachable in any European carpets of any time or country. They satisfy the feeling for breadth and space in furnishing, as if made for the palaces of kings. They are made from a coarse kind of wool peculiar probably to the locality, and are distinguished by their large grandly coloured patterns. The texture of the wool is exactly suited to the designs used, which are gay in tone, colossal in proportion, and wonderfully balanced in harmonious arrangement." The patterning was bold, and arranged in large medallions filled with geometro-floral and animal forms.

The late Mr. J. H. Prince, of Travancore, told me a few months ago that he had seen one or two of these interesting old Malabar carpets, which he described most clearly, and promised to get photographs and descriptions of them. His lamented death, soon after, prevented the securing of any further information. One or two Malayáli gentlemen whom I met at the Industrial and Arts Exhibition, 1903, said they had seen some small rugs, several of which were in rags, and that they were very rare. The only existing specimens appear to be the one or two rugs in the South Kensington Museum, and the one which was in the possession of Mr. Vincent Robinson. (*See* Appendix.)

Cotton pile carpets appear to be now rarely made in South India. They soon look shabby and dirty, and there is very little demand for them. The few that are produced are most often made in the simpler woollen carpet patterns, frequently in shades of blue and white, much after the style of the Multán cotton carpets.

It is strange how little is known of the carpet industry outside the Districts where it is carried on, and the ignorance of some who claim authority to write on the subject is most colossal. W. D. Ellwanger, in his book 'The Oriental Rug,' is good enough to tell us that "India provides us only with some fine large carpets mostly of modern make, and also with many imitations of Persian rugs, made in part by machinery, like the current substitute for a Turkish towel"! and with this five-line paragraph he dismisses the Indian carpet industry altogether, except for a casual allusion or two to India, and to Kashmir carpets.

We have seen that, outside Government and aided institutions, the Carpet Industry in South India has in recent years become debased and degraded, and that, wherever the

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weaver is left uncontrolled, he uses the commonest and most unsatisfactory of dyes, the worst of wools, and is weaving poor, cheap, tawdry carpets. It is difficult to blame him; he has been forced by circumstances to make just what trade wants and will buy. So he cannot, as did his forbears, put his heart into the dyeing and the weaving of the fabric he makes, knowing, as they did, that it would be the admiration of all, and that they could command a good market for it.

In South India the weaver has to contend with a trouble that does not affect his compeers in the North. They have little difficulty in securing several grades of wool, each of which is fairly well suited for the class of carpet usually made in the locality, but I have frequently been told by small master-weavers from Ellore, Masulipatam and Walajanagar that they have often started a good class order-carpet in live wool, and have been compelled, by absolute inability to procure more, to finish it with chunam wool. Ordinary dyeing will never suffice to give "chunam wool" the colours which live wool takes. So they have had to resort to "topping" or overdyeing with anilines, to get something like a match. This of course means that after a year or two the main body of the carpet will have just commenced to "mellow," while the small part worked in dead wool, and overdyed with anilines, will have seriously faded. I have seen several carpets in South India which prove this statement to the hilt, and, I have never, in my eleven years' experience of the industry in Northern India, seen a similar case there, although I have in that time come across many carpets in which some colours were good vegetable ones, and others of cheap German origin.

The suggestion which I have made in the Section on Wools, for the importation of a few high-class rams annually, appears to me the only possible solution of the wool difficulty, for so many of the breeds of sheep reared in the Presidency carry bristly hairy fleeces, which are unfit for anything except the making of the coarsest and the roughest of cumblies.

It is impossible, now that English and German chemical colours have obtained such a hold on the country, that Government can follow the examples of the Sháh of Persia and the Maharaja of Kashmir, and absolutely prohibit, under serious penalties, the importation of these colours into the country. And it seems most unfortunate that this danger to the industry of the country was not foreseen and provided for twenty-five years ago. It would then have been possible also to cultivate systematically upon a commercial basis, many of the cheap vegetable dye-stuffs, all of which are now so little known, and many of which have been forgotten altogether.

Up to the early part of the last century the Indian dyer (who originally came from the old Persian stock) probably had as great a range of dye-stuffs as has the Persian *bayaji*. The extract to be found elsewhere from J. K. Mumford's 'Oriental Rugs'—Dyes and Dyeing—shows how great the selection is. All nature appears to have been laid under contribution to secure the beautiful colour shades of the Persian dyer.

The one remedy for the existing state of things in the dye-shed appears to me to be the establishment at Ellore, or at the Madras School of Arts, of a fully-equipped dyeing class, under a master dyer imported from North India, where trained young weavers, who are able to read and write fairly well, can be admitted as Government scholarship holders, and be put through a thorough course of dyeing. They should be practised in the old vegetable colourings, and also, possibly, put through a course of proper wool-dyeing in the better classes of chrome and alizarine colours. It is unfortunate that the need for teaching this exists at all, but this class of colour has come to stay, and it seems advisable, therefore, that efforts should be made to teach thoroughly and scientifically its proper application. Mr. Baden H. Powell, B.C.S., in his valuable 'Handbook on the Economic Products of

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the Punjab,' 1868, remarks:—"No art suggests so much the want of Vernacular Instructors or Trade Manuals as that of dyeing."

The carpet-weaver class appear to me to deserve all possible assistance and support at the hands, not only of the Public and the Trade, but also of Government. And, as the following remarks in Mr. Thurston's 'Woollen Fabric Industry of the Madras Presidency' agree so entirely with my own views upon the subject, I venture to reproduce them without further comment:—

"Though it would be ambitious to hope that a monograph such as the present one, written, *faute de mieux*, like its predecessor on the Madras cotton fabric industry, by one who is primarily a naturalist, could have any practical result, I have published the recorded opinions of those possessed of the necessary experience to speak with the voice of authority. And, as a sympathiser with the hereditary weavers, who in time of famine, such as we have lately passed through, have to seek the protection of the Government, I would put forth a plea on their behalf as against the long-sentence convict, who is not born a weaver, but becomes one as the result of crime. Far be it from me to wish that convicts should be treated in the manner depicted in 'Never too late to mend.' But I do wish that the convicts, while kept usefully employed, should be employed only at such occupations as are above all suspicion of coming in conflict with the interests of honest folk, whose traditional caste occupation should be protected."

Few of the ruling chiefs in South India do anything for the support of an industry, which, in its best days, was almost entirely carried on in the interests of Sovereigns, Princes, nobles, and the rich. There is little doubt that Akbar, "the Great," brought the art into North India from Persia, and established in Lahore a factory for the making of carpets for himself and his great oomras and feudatories. And, although carpet-weaving evidently came to South India with poor immigrants from Persia, it is reasonable to suppose that for a long time, at any rate, Princes and nobles were the best patrons of the weavers of the south.

To-day almost every Chief and Zamindar prefers to see on his floors the cheap gaudy products of second-rate English and continental power-looms, and he probably pays quite as much for these as he would have to give for a fine copy of an old design made in South India, and which would be—if properly looked after—as much an object of beauty to his great-grand-children as to himself.

In this respect the young Maharaja of Mysore has set a splendid example. In the new palace at Mysore all the carpets and rugs are Indian, some of the largest having been made in North India, and others in the Bangalore Central Jail. It is perhaps unfortunate that no orders were placed with weavers in the other centres of the industry in Southern India, but the difficulty of keeping in touch with, and supervising the work of small master-weavers so far afield, was, probably, inevitable. [Since the foregoing was written we have been told in the newspapers that the carpet for the great durbar hall in the Mysore palace has been ordered from Europe through a Calcutta firm.]

There is at present absolutely no real teaching of wool-dyeing within the Presidency. In the Madras School of Arts the dyer-maistri does not—if weavers who have earned Government Technical certificates are to be believed—give any instruction to the scholars, and this probably because most of the scholars "join the class merely for the sake of the scholarships, which enable them to continue their studies in the drawing classes.' And there appears no reason why they should trouble to learn dyeing, their object being to go "out as drawing teachers or draftsmen."

In the Anjuman schools very little teaching of dyeing has been done. The funds of the institution have never admitted of money being spent to any extent in the teaching of

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dyeing, and the consequent use of dye drugs and wool, although boys have been put to work with the dyer, and so acquired some little knowledge of the art.

The Chengalroya Naicker Technical School, Madras, appears to get its dyeing done outside, because the Anjuman was indented on for the dyed yarns for the last Government Technical Examinations, 1906.

CARPET WEAVING AT ELLORE.

By Mr. ALFRED CHATTERTON, B.Sc.

Between the deltas of the Gódávari and Kistna rivers lies a huge shallow depression known as the Kolair lake. On the northern margin of this swamp, and not far from the ruins of Pedda Vengai, the once splendid capital of the Andhra dynasty, is situated the town of Ellore, where for centuries past the descendants of Persian settlers have pursued their hereditary occupation as carpet weavers. From a commercial standpoint the industry was probably never a big one, but, judging from the number of looms that now stand empty, it formerly gave employment to twice as many people as it does at the present day. Elsewhere in the Madras Presidency, except in the jails, the industry has entirely died out, and here it would also have suffered the same fate, but for the enterprise of Messrs. Arbuthnot & Co. and Messrs. Wilson & Co., who for years past have financed the weavers and shipped their products to England Now, one of these firms has disappeared, and, unless another takes up the same line of business, it is greatly to be feared that the manufacture of the better-class carpets will altogether die out at Ellore.

It is difficult to trace with certainty the causes which have almost entirely extinguished private enterprise in carpet-weaving in the south of India. The jails have a good deal to do with it, the change in the tastes of the wealthier classes has probably more, and finally it is not unlikely that the rapid growth of the population both in numbers and in material prosperity has led to a greatly increased demand for kamblies spun and woven from indigenous wool. Things are at their worst at Ellore just now, as the cyclone of 1905 killed off an enormous number of sheep in the Northern Circars, with the result that the price of wool has risen, and is now fully 2 annas a pound more than it was two or three years ago.

The wool used at Ellore is of local origin, and is obtained from the Kurubas or shepherds, whose flocks of sheep graze in the upland taluks of both the Gódavari and Kistna Districts. The sheep are washed and shorn by the shepherds, and by them the wool is teased and spun into thread. Apparently no spinning wheel is used, but, by a deft movement of the hand across the thigh, the fibres receive the necessary twist to form the yarn. As may be imagined, the spinning is crude, rough and irregular, and the yarn possesses very little tensile strength. Nevertheless, when suitably dyed, it is capable of being worked up into fabrics of great beauty and extreme durability. The wool as it comes from the sheep is black, brown or white, the latter colour naturally fetching a considerably higher price, as it alone can be used for the lighter and more delicate shades of colour. The weavers buy the yarn wound in small cops, and they do all the dyeing themselves. For the better class of carpets vegetable dyes are still used, but for the cheap carpet and rug trade, which is the speciality of Messrs. Wilson & Co., aniline dyes are invariably used. Nothing need be said about the methods of dyeing employed, as with but slight modifications they are in use wherever vegetable dyed carpets are made in the Presidency. Most of the jail maistries, and the instructors in the Government School of Arts in Madras and in the

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Anjuman Workshops, follow Ellore methods of dyeing, though it is probable that modifications are slowly being introduced. Undoubtedly this is the case with indigo, as it is much less trouble to use the artificial product of the German dye works. Nevertheless, natural indigo is still used in Ellore, and there is no doubt that the permanence of colour thereby secured is worth the extra trouble and expense.

Carpets are made in Ellore, and in the suburbs of Tangallamudi and Sannivarapettah. There are said to be about 100 karkanas or carpet factories, with an average of about two looms in each. Many of the karkanas contained only one loom, and that often a small one suitable only for making rugs; but, on the other hand, some contained seven or eight looms varying in length from 12 to 18 feet, the largest loom in the town having a span of 24 feet. For warps cotton seems to be almost invariably used, and apparently Messrs. Binny & Co. have a monopoly of the supply. The threads of the weft or woof are usually of jute, but sometimes twine or hemp is employed. The price of carpets varies with the number of stitches to the foot, Rs. 10 a square yard being charged for carpets with 100 threads to the foot, Rs. 8 for those with 90, and Rs. 4 when the number does not exceed 55. The weavers are invariably paid on the piece-work system, the unit of work being a length of $1\frac{1}{2}$ feet, for which 2 annas is paid for every 50 *varisas* or lines of stitches in the case of coarse common carpets, and 2 annas for every 30 *varisas* in the case of the much finer carpets. Practically this amounts to the weaver tying 2,250 knots per anna. At this rate a man can earn about 3 annas a day at the utmost. And as the weavers do not combine their trade with agriculture, they are always in a state of poverty, and, when trade is slack, are often reduced to destitution. All the weavers are Muhammadans, and, as the women are gosha, only the men are wage-earners. The industry is mainly in the hands of two or three maistries, who receive advances, and distribute the orders to their piece-workers. Occasionally carpets are made for Zamindars and wealthy natives, more frequently for European officers, but in the main the trade is now in the hands of the two firms already mentioned. The old patterns are still well known, and, if the men are left to themselves and not too much restricted in the matter of price, they are capable of producing carpets and rugs of as good quality as ever they did.

For the export trade, especially in the cheaper lines, patterns are usually supplied. The designs are generally simple, and, as the dyes are invariably anilines, the colours are crude and glaring. It is to be regretted that hand labour should be degraded to producing such inferior work. The patterns of the old carpets consist of the border or *anchu* and the *khana* or central ground, and a large number of varieties of carpet are obtained by the various combinations of *anchu* and *khana*, and by changes in the colours of both. Both *anchus* and *khanas* have received distinctive names. Among the former may be mentioned the Jampal or guava, the Chola Ghana or small marigold, the Bada Ghana or large marigold, the Kuthavan or God, and the Thumba anchu. Several well-known patterns have received the names of the persons associated in some way or other with their origin. Such is the Ankinedu, which is the family name of the Sallapilly Zamindar, the Rohde * *anchu* named after some European who furnished the design, and the Latchma Rau anchu. Names of the more important khanas are Gopal Rao, Ramachundra, Hashim, Pharsi, Shâhnamaz, Gulbunthi, Ambarcha Ananas, Shâhnamal, and Babul.

There is little vitality, and absolutely no originality whatever among the carpet-weavers at Ellore at the present time. The work is purely mechanical and entirely confined to the re-production of their old patterns, or the copying of such as are furnished to them. The

* This is evidently John Rohde, M.C.S., who retired from the service about 1865, as Inspector-General of Jails, one of the finest carpenters and mechanics, if not the finest who ever was in this Presidency. Wherever he went, he built houses. I have been in houses built by John Rohde 25 years before I was in them, and *still* every door and window fitted perfectly.—W.F.G.

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industry is in a very decadent condition, but will continue to exist so long as orders can be obtained at prices which will furnish the most meagre livelihood. It is difficult to say whether anything can be done to resuscitate the industry, but it is easy enough to indicate the directions in which work will have to be done.

The supply of wool is precarious, and of an inferior quality. It seems doubtful if there is enough to justify the establishment of a modern spinning plant, but probably, if such were established, a considerable quantity of wool now consumed in the manufacture of kamblies would become available. The native processes of dyeing with vegetable colours produce satisfactory results, but they are crude, inefficient and expensive. Possibly much could be done to improve them, and, in some cases, alizarine dyes might be introduced with advantage. The weavers themselves want training, and their artistic perceptions, if they have any, awakening, and finally the industry, if it is to pay and flourish, must be confined to the manufacture of the highest class of carpet.

There is a steady demand for Indian carpets, and the jails usually have more orders than they can supply, but the total production of carpets in India is very small, and it is doubtful if they have ever been properly exploited in the markets of the rest of the world. At present each jail disposes of its own manufactures, and a certain number of carpets are sold to people in India. Much has been written and said about the blighting influence of jail competition, and there is no doubt that it has to some extent prevented the development of the Indian carpet trade. It is further doubtful if the jail-made carpets are disposed of to the best advantage. Throughout India the total production of jail-made carpets probably amounts to several lakhs of rupees, and, if these were sent home to a Central Government Depot, and an efficient agency established to dispose of them, much higher prices would probably be obtained. And, if the local sale of carpets in India were entirely prohibited, private enterprise would probably become more vigorous. In Europe and in America Indian carpets are not properly advertised, and there is but little doubt that, if this were done, ten times the present production could easily be disposed of. The question is whether it is worth while, whether the available supply of wool cannot be better utilised in providing clothing for the people, and whether it is desirable to encourage and resuscitate on a large scale an industry, which, even under the most favourable circumstances, can only afford a miserable livelihood to the majority of the workers.

MESSRS. WILSON & Co. OF MADRAS HAVE BEEN GOOD ENOUGH TO COLLECT THE INFORMATION EMBODIED IN THE FOLLOWING NOTE.

There are about 3,000 weavers in Ellore and District, and there are about 400 looms, which vary in size from 3 to 30 feet. Some of the weavers combine their trade with agriculture, but most depend upon weaving for their livelihood. In some cases the families of the weavers work at cleaning and spinning wool, and weaving, dyeing, etc. Where the family does not perform the work, either coolies are hired, or the cleaned and spun wool is bought outside ready for weaving. Weavers in Ellore are usually paid by the day, at the rate of 4 annas. The wool used in Ellore comes wholly from the Gódávari and Kistna Districts. The Ellore make of carpets is approximately about 555 bales or 55 to 60,000 square yards per annum. The usual quality is 4½, 5 and 5½ stitches per inch.

The wool used in the District is mostly dead or "*Chunam*" wool. This is the wool cut from slaughtered or dead sheep after death. It is called "*limed*" or "*chunam*" wool because it has to be treated with lime and other strong alkalies before it is taken into use. We

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know of no means of removing the objectionable odour from limed wool except by washing several times in water.

For the most part cotton thread is used for the warp, which thread is supplied principally by Messrs. Binny & Co. For jute-backed carpets the twine comes from Calcutta. Jute, however, has practically ceased to be used now.

Practically the whole of the output of the Ellore looms goes to the London market.

The finest stitch grade carpet or rug that is made is 90 threads per foot, and the coarsest is 36 threads per foot.

We have no knowledge of the processes used in dyeing at Ellore. Should wool be dyed to an excessive colour, it is used as it is. We do not think dyers make any effort to get rid of the excess, but have no definite knowledge on the point. Topping, second or over-dyeing with anilines is practised to give brightness to soft dull colours.

There is a ready sale for all sizes of mats, rugs and carpets from 2 feet 10 inches by 1 foot 4 inches up to 30 by 20 feet. "*Farsikhani*" is the most popular design, and the most expensive to make, "*Hashamkhani*" or "*Aushankhani*" is also a popular design.

Large numbers of carpets and rugs [especially the latter] continue to be made for shipment through Madras firms to the Auction Sale Warehouses in Cutler Street, London, but the "order" trade has largely increased during recent years. "Consignment" goods are only advanced against when received and examined by Madras agents. The advance depends upon colours, quality, etc.

The designs in greatest demand are "*Farsikhani*" and "*Aushankhani.*" The former, however, has an almost prohibitive handicap in its very high first cost. Most of the designs made are old Oriental ones, though some are copied from modern ideas. The price of wool has been going up steadily during the past few years; about 1902 the price was approximately twenty-five pounds per rupee, now it is twelve to fifteen pounds per rupee.

NOTE BY MR. G. CLONEY, SUPERINTENDENT, CENTRAL JAIL, VELLORE, UPON THE CARPET INDUSTRY AS CARRIED ON IN THAT JAIL.

About 100 convicts are employed at carpet-making in the jail. The smallest loom is 3 feet wide, and from thence the sizes range onwards; the largest is 30 feet wide. There are 46 looms and 370 feet of loom space. The convicts employed were agriculturists in their homes. The jail obtains supplies of raw wool locally, from Bangalore and from Bellary. The convicts clean, wash and spin it themselves. The female prisoners do a considerable portion of the spinning. Wool ready spun is not available in the local market. The wool has first to be bowed or teased; this is done here by machinery after the impurities or adulterations have been removed. The teased wool is rolled up into wicks, and spun by hand. The spinning wheel used is the time-honoured wheel of India, known and recognized in each and every village throughout the country.

Carpets are made of 36 threads to the inch, and range up to 144 threads according to quality. The quantities of carpets made in a year are about 1,655 square yards.

Wools in use are as under—

(i) Superior wool.
(ii) Superior second-sort wool.
(iii) Chunam or dead wool of all natural shades.

Cotton yarn Nos. 4's and 10's are used for warps, and also English twine, jute and hemp, whenever so ordered. Cottons are obtained from private trading mill owners throughout the

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Presidency. European twine is obtained from Madras. Convicts weave the carpets. There is a free maistry who looks after the work, and his pay is Rs. 30 a month. A trained convict weaver does 144 to 180 square inches per diem in the lower grade carpets.

Three classes of carpets and rugs are usually made, namely :—

I. At rupees 10 to rupees 16 per square yard
II. At „ 6 to „ 9 „ „ „
III. At „ 3-14 to „ 5 „ „ „

according to quality.

The aniline dyed carpets are the cheapest kind. Carpets are made as ordered by Messrs. Wilson & Co. and Mr. R. Simpson, Madras, who export to England. Orders from private individuals also form a considerable output throughout the year. The finest stitch grade carpet or rug that is made is 256 stitches to the square inch; the commonest grade carpet or rug made is 36 stitches to the square inch. Vegetable dyes are the most permanent, and consequently the best. Coal tar and aniline dyes are fugitive, and are therefore not generally used, but the latter are used only for carpets for trade purposes, and when so ordered. Those requiring good carpets never order either coal tar or aniline dyed ones. Cultivated indigo is the only matter used by us. I am unable to compare this with synthetic indigo, etc., which have never been tried.

Indigo is ground with sulphuric acid, and has to be kept over for 24 hours before it can be used. The mixture is then treated with boiling water, and diluted according to the shade required. The sulphuric acid solution (sulphate of indigo) is the process adopted here. My experience goes to show that this method gives more satisfactory results in dissolving and drawing out all colouring matter.

The drugs required for dyeing 10 lb. of wool are as follows :—

DEEP GREEN.

10 lb. Blue wool.
4 lb. Murukkambu (flowers of *Butea frondosa*).
1½ lb. Turmeric powder.

TERRA COTTA.

3¾ lb. Lac dye.
2½ lb. Turmeric powder.
1½ lb. Alum powder.
8 lb. Tamarind.
5 lb. Fuller's earth.

ORANGE.

1½ lb. Turmeric powder.
12 oz. Alum.
4 lb. Murukkambu.
4 oz. Chunam.
6 lb. Murukkambu.

SCARLET.

1 lb. Lac dye.
2 lb. Tezab or acid.
2 lb. Pomegranate bark.
½ lb. Turmeric powder.

COPPER RED.

4 oz. Gallnut powder.
4 oz. Turmeric powder.
24 botts. Logwood infusion.
oz. Catechu.

DULL OLD GOLD.

10 lb. Red wool.
1½ lb. Turmeric powder.
12 oz. Alum.
5 lb. Murukkambu.
5 lb. Fuller's earth.
1 oz. Iron sulphate (Heerakasees).

DEEP YELLOW.

1½ lb. Turmeric powder.
12 oz. Alum.
4 lb. Murukkambu.
1 oz. Iron sulphate.

LEMON YELLOW.

1½ lb. Turmeric powder.
8 oz. Alum.
6 lb. Murukkambu.
4 oz. Gallnut powder.

DEEP BLUE.

6 oz. Indigo.
1 lb. Sulphuric acid.
8 oz. Alum.
15 lb. Chunam.
3 oz. Iron sulphate.

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PURPLE.

1 lb. Lac dye.
4 oz. Sulphuric acid.
1 lb. Pomegranate.
1 lb. Turmeric powder.

LIGHT GREEN.

10 lb. Blue wool.
1½ lb. Turmeric powder.
1 oz. Gallnut powder.
4 lb. Murukkambu.

OLIVE GREEN.

10 lb. Blue wool.
144 botts. Murukkambu water.
4 oz. Turmeric powder.
½ oz. Iron sulphate.

BRIGHT YELLOW.

1½ lb. Turmeric powder.
1 lb. Alum.
8 lb. Murukkambu.

PALE BLUE

6 oz. Indigo.
1 lb. Sulphuric acid.
28 oz. Alum.
20 lb. Chunam.

SAPPHIRE BLUE.

6 oz. Indigo.
1 lb. Sulphuric acid.
8 oz. Alum.
10 lb. Chunam.

SAP GREEN.

10 lb. Blue wool.
1½ lb. Turmeric powder.
4 lb. Murukkambu.

PEA GREEN.

10 lb. Blue wool.
1½ lb. Turmeric powder.
1 oz. Gallnut powder.
4 lb. Murukkambu.

BRONZE GREEN.

10 lb. Blue wool.
1½ lb. Turmeric powder.
4 lb. Murukkambu.
8 oz. Gallnut powder.
4 oz. Catechu.

GRAPE GREEN.

10 lb. Blue wool.
1½ lb. Turmeric powder.
4 lb. Murukkambu.
2 oz. Gallnut powder.

NUTTY BROWN.

3 oz. Gallnut powder.
3 oz. Turmeric powder.
8 botts. Logwood water.
6 oz. Catechu.

KHAKI.

4 lb. Gallnut powder.
2½ seers Chunam.
5 lb. Fuller's earth.
1 lb. Catechu.
8 oz. Turmeric powder.
8 oz. Yellow ochre.
1 lb. Pomegranate.

CAMEL COLOUR.

2 oz. Iron sulphate.

DEEP ROSE COLOUR.

2¼ lb. Lac dye.
1½ lb. Alum.
8 lb. Tamarind.
5 lb. Chunam.

FLESH PINK.

2½ lb. Lac dye.
1¾ lb. Alum.
8 lb. Tamarind.
5 lb. Chunam.

DARK BROWN.

4 oz. Gallnut powder.
4 oz. Turmeric powder.
24 botts. Logwood water.
8 oz. Catechu.

LIGHT BROWN.

2 oz. Gallnut powder.
2 oz. Turmeric powder.
6 botts. Logwood water.
4 oz. Catechu.

BUFF.

3 oz. Iron sulphate.

CREAM.

5 lb. Fuller's earth.
8 oz. Bar soap.

PALE ROSE COLOUR.

1¼ lb. Lac dye.
1 lb. Alum.
7 lb. Tamarind.
5 lb. Chunam.

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Dyed yarn is washed in vats to get off surplus colouring matter. Topping, or second dyeing, is done to produce brightness of shades. There is always a demand for carpets. The most popular sizes are 15 by 12 feet to 6 by 6 feet. Purely Indian designs are most appreciated. Carpets and rugs are now ordered by Messrs. Wilson & Co., Madras, and Mr. R. Simpson, Madras, for export. All designs as made here, both for trade and private, are solely Indian. We manufacture only to order, and payment is made at time of delivery. We use only country wool; mill spun or any other kinds of wool imported or mill treated, are not used.

—	1903.	1904.	1905.	1906.
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Chunam white wool *per 25 lb.*	2 8 0	2 2 6	2 8 0	2 14 6
Superior white wool	5 12 0	6 6 0	6 6 0	6 4 0
Superior black wool	.....	5 0 0	5 4 0	5 4 0
Red (rufous and brown) wool	1 2 0	1 8 0	2 0 0	2 4 0

The objectionable odour from chunam or dead wool is caused by the tanning process, and the adhesion of particles of animal matter. The odour can be removed by 24 hours soaking in quick (stone) lime, and afterwards thoroughly washing out with Fuller's earth. After this is done, the wool should be washed thrice in clean water.

NOTE ON THE INDUSTRY IN THE BANGALORE CENTRAL JAIL, BASED ON INFORMATION GIVEN BY DR. P. S. ACHYUTA RAO, OF THE MYSORE MEDICAL STAFF.

The number of carpet weavers varies with the work in hand. Just now, owing to all the looms being in work, the number of convicts employed is 62. There are nine looms, varying in length from 21 to 29½ feet, the total carpet loom space being 191 feet. The men employed are not by profession carpet makers. Such of the long term male convicts as show an aptitude for the work, and are possessed of the requisite amount of intelligence, are trained here. By profession they are mostly agriculturists or traders.

The required quantity of raw wool is supplied by a contractor. The wool is altogether cleansed, washed, bowed and spun by convict labour. Carpets are made only to order, and by ones and twos; and contain from 4 to 16 stitches to the inch, according to the nature and quality of the carpet. Wools in use in this jail are clipped white, clipped black, clipped fawn, and clipped grey. So far as experience has taught, it is found impossible to remov. the fetid odour of limed wool which gets moistened. So long as the wool is dry the odour masked, but on drying there is a return of the fetor which is not wholly avoidable. On, cotton thread is used in warping and woofing. The thread is obtained from the contractor. The carpet maistry is paid Rs. 15 per mensem, and he is not a convict. The quantity woven averages 4 inches a day of the carpets having 8 stitches to the inch, 2 inches a day of those having 12 stitches to the inch, 1½ inches a day of those having 16 stitches to the inch. The finest quality carpet made is the "Polly pattern", in quality 16 stitches to the inch; the coarsest quality is the "Persian flower pattern" 4 stitches to the inch.

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The dyes used in this jail are German-made aniline dyes ["Aniline and soda fabrik"]. Only Madras-made indigo is used here—it answers the purpose fairly well. The principal substances used for dissolving indigo are fuller's earth, chunam and indigo seeds.

The dyeing process for indigo is as follows:—

(1) Fuller's earth and chunam are first powdered and mixed together, and put into a big earthen pot or *gudava* having a small hole at the bottom, and filled with water and placed on the top of another *gudava.*

(2) Indigo seeds are well boiled, and then pounded with the indigo, and left to soak in water for about a week.

(3) The water which passes through the small hole in the upper of the two *gudavas* is well mixed with the boiled indigo, and a solution is made.

(4) The wool, after being well washed in chunam water, is soaked in the said solution, well stirred, and left for a day. The wool is then taken out and dried in the sun.

Scarlet or red.—Take 10 lb. of white wool, which has been well cleaned by boiling in water, with which 2 lb. of fuller's earth have been mixed. Take 3 lb. of lac, and put it to soak for half a day in a pot half full of water and having a cover. The lac is then taken out and ground into a fine powder; one potful of water is poured on to it, and left to stand in the same pot. Next pour three small potfuls of water into another big pot, and, mixing 8 lb. of tamarind with it, allow it to stand for a whole night. Next morning place a big dyeing pot on a fire place prepared for the purpose. The fluid substance of 3 lb. of lac should be poured into the pot, and to this should be added 2 lb. of powdered alum and two small pots of tamarind water. When well mixed, these ingredients should be well boiled, and the 10 lb. of cleaned wool placed in the pot. The remaining tamarind water should be added, one small potful at a time once every hour. The wool so boiled will take on the required red colour. Lastly dip the wool in 1½ potfuls of water, to which the juice of 25 limes has been added. The wool is then put out to dry.

Orange.—Take 10 lb. of uncleaned white wool, and soak it for half a day in cold water, with which 2½ lb. of yellow powder [aniline fabrik] have been well mixed. Put 2½ small potfuls of water in a large pot, and mix 2½ lb. of the yellow flowers of *muthakada huvvu* [*Butea frondosa*] from which all stalks, etc., have been completely removed. Add 10 lb. of powdered alum and 1¼ lb. of powdered turmeric. Watch the wool till it boils, and have ready 18 pots of water mixed with 3 lb. of fuller's earth and one small pot of thick chunam water, and, when it turns to the required orange shade, take it out and dry in the shade.

Bright or light yellow.—Take 10 lb. of uncleaned white wool, and soak it for half a day in cold water with which 2½ lb. of yellow powder have been well mixed. Put 2½ small potfuls of water in a large pot, and mix 2½ lb. of *muthakada* flowers free of all stalks, etc. Add 10 lb. of powdered alum, 1¼ lb. of powdered turmeric, boil well and put in the wool. When it turns of the required shade of yellow, take it out and dry in the shade.

Pale or light blue.—Take 10 lb. of white wool, wash it in water containing 5 lb. of chunam, and leave it to soak in the same water for a night. In the morning the wool should again be well washed. Mix half a pound of the best quality of indigo, and put six small pots of water to boil. When well boiling, put in the wool and ½ lb. of the indigo solution. Stir and shake the wool well until it is of the shade required, when it should be removed, washed in cold water, then in alum water, and dried in the sun.

Deep or dark blue.—The same process as for light blue, except that 1 lb. of indigo solution is used instead of ½ lb.

Light green.—First dye the wool dark blue by the process detailed above. Put 3 lb. of *muthakada* flowers into three pots of water. Stir well together, and, when the water turns red, remove the yellow flowers and put in 1½ lb. of powdered turmeric. The dark blue

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wool should then be put in, piece by piece, in small quantities, and the whole left to soak for a day. It should then be washed in the same water, taken out and dried in the shade.

Dark brown.—Follow the same process as for orange, but using raw red [brown or rufous] wool.

Light brown.—Take six pots of water mixed with one pot of thick chunam water. Into it put 10 lb. of white wool, and leave it to soak for a night. In the morning remove the wool, wash and dry it in the sun with three pots of cold water. Mix 1½ lb. of powdered catechu, one pot of log-wood water and 1 lb. of palmyra jaggery. Set the mixture on a fire, and, when quite boiling, put the wool into it, stir well, and when of the proper colour, remove and dry in the sun or shade.

Khāki.—(1) Take 10 lb. of white wool, leave it to soak for a day in a pot containing three small pots of water mixed with 4 lbs. of powdered gallnuts. Take it out and dry it in the sun.

(2) Dip the wool so dried in four pots of water mixed with 4 oz. of "*hirakasis*" (sulphate of iron), leave it to soak for 10 minutes; take it out and again dry it in the sun.

(3) Mix 1½ lb. of turmeric and ¼ lb. of alum well-powdered. Put into three pots of water, and boil well. When quite boiling put in the wool, stir it well and boil it for 4 hours. Then remove the wool from the pot, and dry it in the sun.

(4) Mix together ¼ lb. each of arecanut, turmeric, fuller's earth and catechu, powder well, put into a pot containing about 2 measured seers of cold water, and wait for half an hour. Then take the solution little by little and pour it on the wool, taking a small quantity of wool at a time, until every one of the batches of wool takes up the right colour. Then dry the wool in the shade. The dyed wool is steeped frequently in water, to remove excess of colour.

The topping of dyed wool with aniline dyes is practised to give additional brilliance to the colours. The sizes and patterns most frequently demanded are 6 feet by 3 feet, and 7 feet by 4 feet.

The Persian flower design, and what is known as "Krishna Murti" pattern are those most commonly made. The jail does not send any carpets to warehouses for outside sale. For order trade "Persian flower," "Krishna Murti," "Hindu", "Herat" and "Scorpion" designs are in most frequent demand. Ordinarily mill spun yarn is not used. Spinning is done in the jail by convict labour. There has been a considerable fall in the price of wool in the past year.

	Clipped white.	Clipped black.	Clipped fawn.
	RS. A. P.	RS. A. P.	RS. A. P.
1903	7 0 0	6 8 0	4 4 0
1904	7 0 0	6 8 0	4 4 0
1905	7 0 0	6 8 0	4 8 0
Present price	5 14 0	5 0 0	2 14 0

NOTE BASED UPON INFORMATION SUPPLIED BY MR. C. KUPPUSAWMY IYENGAR, AMILDAR, ON THE BAZAAR CARPET TRADE IN BANGALORE CITY.

The exact number of weavers cannot be ascertained; the number varies with the demand for carpets. Ordinarily Messrs. Subbiah Chetty & Co. have 18 men working in their factory, and Messrs. Munisamiah & Co., 20 men. There are other weavers in Carpet street, but they do not employ any labour, the men and boys belonging to the family

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themselves working. When there is increased demand, extra labour is employed. The average length of the looms in use is about 3 yards. The largest loom is 24 feet long.

Subbiah Chetty has 14 looms and Munisamiah eight looms. I have been to some other weavers. They have between them 13 looms. I was not able to find out the exact number of looms in use in the city of Bangalore. The Vice-President of the Municipal Commission informs me that, since the loom tax was abolished in 1897-98, no information as regards the number of looms is available. Some of the weavers combine agriculture with weaving.

All members of the families of the poorer weavers work at cleaning and spinning wool, and also at dyeing. In well-to-do families, this is done by the men and boys. In all cases, however, weaving is done by the men and boys only. The weavers buy the wool from merchants, who get the same from sheep owners in the District of Bangalore. In many cases, the weavers themselves buy the wool direct from the sheep owners. In the majority of cases, the wool is unspun at the time of purchase, and the weavers and their families tease, clean, wash and spin it.

The weavers are not prepared to give out the methods adopted in teasing, spinning, etc. Teasing is invariably done with the native bow, and spinning is done by the hand wheel. Five different kinds of wool are used.

Cotton, hemp, hemp and jute, jute yarn and thread are all used for the warps and wefts. It is left to the purchaser to select which of the above should be used.

Thread is generally purchased in the bazaars. Some of the weavers get it from the Bangalore Cotton, Woollen and Silk Mills (Limited).

The quality depends on the demand; the stitch count of carpets principally in demand being from 3 to 10 stitches per inch.

Weavers are paid for work done [piece-work], rates varying from As. 4 to Rs. 6 per yard according to the quality of the carpet woven. The quantity woven by a steady weaver also depends upon the quality of the carpet. Such a weaver can make about Rs. 10 a month.

Woollen carpets [known as webbing carpets], pile carpets and plush carpets—any kind of carpets—are made according to order.

Carpets are sent to England, America, and to many places in India. It is the well-to-do classes that export carpets. They advance money to poor carpet weavers, and get carpets made by them for export purposes.

The finest stitch grade carpet or rug that is made has 10 stitches per inch, and the coarsest has 3 stitches per inch.

The old vegetable dyes are the best and most costly; their colour is permanent and rich looking.

Aniline dyes are used for cheap carpets. They are less costly than vegetable dyes. They lose colour very soon. For very cheap carpets, pure aniline dyes are used. For ordinary carpets, aniline dyes are mixed with vegetable products and oil [*sic*] to make the colour fairly fast. For costly carpets, pure vegetable dyes are used.

Synthetic indigo is unknown to weavers here. The dyers in the bazaar use only indigo made in Mysore and the Madras Presidency, and no other.

The weavers are not aware of any of the processes adopted for dissolving indigo, as they do not dye in it. There are other people in the city who do, but they have methods of their own, which they consider to be trade secrets. The dyers know nothing of the processes for indigo dyeing mentioned in the question.

Various dye processes.—I have tried my very best to collect materials for answering these questions. I was not successful, as the weavers consider these as valuable trade secrets. No amount of persuasion on my part was of any avail. The weavers say that no two people adopt the same method, or use the same ingredients. More than this, they are not prepared to state.

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Every weaver prefers running water to remove excess dye, but, as running water is not readily available anywhere near Bangalore, the dyed yarn is steeped in water several times, to remove the excess dye.

Topping with aniline dyes is practised to give brightness to dead dull colours.

There is not much demand for plush or pile carpets. There is a ready sale for ordinary or webbing woollen carpets. The sizes most in demand are 3 feet by 6 feet, 4 feet by 7 feet, and 6 feet by 9 feet. Such sizes are always in stock. Other sizes are made to order.

The carpets in stock are of very ordinary designs, mostly plain with floral borders. Those made to order are prepared in any designs which the purchasers require. Carpets exported are mostly plain, in buff or green colour, and with suitable borders. The quality generally in demand is 5 or 6 stitches per inch, the price being about Rs. 2-8-0 per square yard. Price varies from As. 14 to Rs. 14 per square yard.

Indigent weavers do not themselves export carpets; they sell them locally, or to the well-to-do weavers.

Carpets are sent to various firms in England, including the Cutler Street auction and sale warehouses in London.

Generally, designs accompany orders, and the carpets are made according to designs sent. Plain carpets are in most demand, as they last for a longer time than carpets with floral or other designs. The latter get torn at the flowers soon [*sic*]. In some cases designs, combinations of antique patterns or original European ideas, are sent out to be copied.

If orders are sent by firms of standing, carpets are woven on receipt of orders, and the full price of the same is paid when the carpets reach the shipping agents at Madras.

Ordinarily, weavers buy wool locally, and spin it themselves. They find that the locally spun yarn is cheaper than the mill spun or imported woollen yarn.

With local yarn, they are able to weave fine carpets. Sometimes, owing to dearth of local yarn, or if specially desired by customers, mill spun or imported yarn is used. The local weavers consider the mill spun or imported yarn to be very good stuff, though expensive. The carpets made with such yarn are proportionately costlier than carpets made with the locally spun yarn.

I could get information only about fleece wools, and nothing about woollen yarn. The price of a pound of wool in 1904 was about 3 pies less than in 1903. In 1905 the price of wool rose by about 6 pies per lb. and there has been a further increase of about 3 pies per lb. in 1906. The price of wool now ranges from 5 annas to 1 anna a lb.

THE WOOL IN THE CARPET.

Unlike most other textile materials, such as cotton and silk, wool is not the product of certain latitudes only, but may be said to be a product of all parts of the world. Few animals adapt themselves so readily to diversities of climate and pasturage as the sheep, and few are more susceptible to improvements induced by the care of man and selection in breeding.

The effect of the intense heat of the Madras plains is to produce a harsh dry brittle wool with little of the natural wool-fat, while the small amount of attention paid to the breeding of sheep results in great unevenness of fibre, and to the occurrence of a good deal of dead useless hair, which greatly diminishes the value of the wool.

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Kemps, long harsh dead hairs, are frequent in almost all wools raised on the plains, and are not uncommon in most of the hill grown fleeces. They will not felt, and, not being serrated at all, will not keep their place or 'cling' in the yarn; they soon protrude and, if present in large numbers, give the carpet a ragged appearance. Kemps are said to indicate in-breeding. They take up very little dye, and no mechanical means of removing them from the wool appears to have yet been discovered. They are rarely removed, except for very fine quality carpets, and then before the yarn is spun.

"The best woolly breed of sheep in the Madras Presidency is, I learn, the Coimbatore breed. The woolly breed is known in Tamil as *Kurumbadu*, and the non-woolly breed as *Semmariadu*. Woolly sheep are met with in parts of the Námakkal and Perambalúr taluks, and of a few taluks of districts adjoining Coimbatore. The Coimbatore breed, being generally white all over, except the face, is a source of white wool.

"The black woolly Mysore breed is met with in the Bellary district and parts of Kurnool, but it is not so good as in its native Province, and the wool frequently degenerates into straggling hair.

"Neither the Madras nor the Nellore breed of sheep furnishes, according to Dr. Shortt, wool or hair good for textile purposes, and the Madras breed has the following wide area of distribution:—North Arcot, South Arcot, Chingleput, Ganjám, Gódávari, Kistna, Madura, Salem, Tanjore, Tinnevelly and Trichinopoly districts."

"In six out of the twenty-two districts, into which the Madras Presidency is sub-divided, viz., South Canara, Chingleput, Ganjám, Malabar, Tinnevelly and Vizagapatam, no woollen industry is now carried on." THURSTON.—'The Woollen Fabric Industry of the Madras Presidency.'

The 'Sáidápet Farm Records'.—C. Benson, 1885—are well worth quoting here. "Sheep . . . . . are extensively raised as a source of animal food, but as yet there is no general demand in the country for the supply of well-fed mutton. There appears to be no reason why over extensive tracts, Southern India should not compete in the supply of fine wools for manufacturing purposes."

The records tell us that the once well-known Saidápet breed of sheep "can be traced to a mixture of the Patna, Nellore, Mysore, and Coimbatore breeds" and that "up till 1880 the improvement in the quality of the sheep had been obtained by careful weeding out of the flock and the use of the best rams available." We learn that the imported Patna sheep and their progeny stood the dry, parching weather of April, May and June 1870, much better than the Nellore and Mysore breeds did; and that, "though grazed with the Nellores, and fed on the same food," the Bengal breed "suffered very little, and were always in fair condition," while all the Nellore sheep fell much out of condition and a considerable number died, as did a few of the Mysore breed. "Of all breeds—Nellore, Patna, Mysore, and Coimbatore—the Patna is undoubtedly the best." In 1880 "after small-pox had reduced the flock to half its former strength," two half-bred Southdown-Mysore rams were got from the Kunigal farm in Mysore. This cross showed better wool than that previously clipped, and the sheep were of a better character.

The Saidápet farm has proved that its breeding experiments have resulted in a great improvement in the wool, as well as the quality of the mutton raised on the farm. For "in 1872 a London wool broker reported that the two samples of wool sent to us for valuation are 'fair East Indian yellows,' worth here from 11*d.* to 11½*d.* per pound." When this valuation was made, "'ordinary' Australian and New Zealand wools were selling at an average of 1*s.* 2½*d.* per pound." Both the above prices were for broken pieces and locks, and not for fleece wools, which are worth much more.

Mr. Benson says:—"A good many years must yet elapse before the breed can become thoroughly well established. In view to the saving of time, it would be well to procure

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from Northern Australia or Southern Europe a few rams of a short-wooled breed, in order that by judicious crossing the desired results may be hastened."

Wool in Mysore.—"Sheep are of three varieties, the "*Kurubar*" or ordinary breed, so called from the caste which rears it; the "*Gollar*," which is less common and which owes its name to the same cause; and the "*Velaga*," which is the rarest of the three. White, grey, brown, rufous, and black wools are found in all three breeds. The *Kurubar* is a small sheep, with horns curling backwards. Both its flesh and wool are superior to those of the other two varieties. The *Gollar* is distinguished from the *Kurubar* by its large size, coarser wool, longer neck and different formation as to the head and jaws. The *Velaga*, which is rare, is longer in the leg, and stands higher than the other breeds, but is less bulky and more resembles a goat in the structure of the body and limbs. The sheep of this variety are rarely shorn of their wool, it being generally too coarse for manufacture; they shed their coats once a year. This is the breed which is in Mysore used for draught and the carriage of children. The *Gollar* sheep are left out at night at all seasons and in all weathers, and do not appear to suffer from the exposure, while the *Kurubars* and *Valagas* are invariably housed at night. The different breeds are never mixed, chiefly owing to antagonism between the Kurubar and Gollar castes; but, even in the absence of enmity between the shepherds, it is doubtful whether the two varieties could ever be brought to mix, and it is pretty well established that the *Velaga* will not amalgamate with the other two. They are solely dependent on pasturage, never being fed on grain.

"Sheep are shorn twice a year, and fifty fleeces amount to about a pucka maund [82½ lb.] weight. The wool is all coarse. The shepherds usually hand over 100 fleeces to the weaver, who gives them in return a kambli.

"The woolly breed of sheep, which exists throughout Mysore, is fairly esteemed," says Dr. Shortt, "both for its mutton-forming and wool-producing qualities. The rams have large heavy horns, wrinkled and encircled outwards, and their points inwards and outwards. The head is large and heavy looking, with a prominent Roman nose. The ears are of moderate size and pointed, and the tail short, never exceeding 3 to 4 inches. The ewes are mostly hornless. The prevailing colour is from a light to a very dark grey or black. They have fairly compact carcases, with good width, prominence and depth of chest, the body is well wooled and rectangularly formed; in picked specimens the counter is full and the shoulder is fairly filled when in condition. The fleece never exceeds 3 to 4 lb., and the staple averages 3 to 4 inches in length.

"All the breeds of sheep in Southern India are pugnacious and reared to fight, the preference always being given to the black woolly breeds of Mysore or to those of Coimbatore. This breed extends from Mysore to Bellary, where after a time the wool frequently changes into long lank hair.

"For many years Sir Mark Cubbon had an experimental sheep farm at Heraganhalli, Nagamangala taluq. Merino rams were imported yearly from Australia, and the cross breeds distributed all over the country. The breed of sheep throughout the Province was thus immensely improved both as to size, quality of mutton, and wool. The wool was sent in bales by the Mysore Government to England for sale, as well as for the purpose of being manufactured into blankets and serge. The farm was given up in 1863, as it did not pay expenses. This was owing apparently to sheep-breeding alone receiving attention: if other branches of farming had been combined, the results would probably have been more favourable".—RICE. 'Mysore Gazetteer.'

It appears most probable that the importation of selected rams from the hottest districts of Queensland or South Africa, from the Persian Gulf or Arabia, or even from the North West Frontier Province, the Punjab, Upper Sind or Baluchistan [where there are excellent

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sheep with good characters for their fleeces and carcases] would do much to improve the very poor breeds of Southern India. Such would probably live longer and give far better results than the bringing in of high grade rams from more temperate climates, for they would be likely to stand the heat well. These rams could be mated with selected ewes in the districts, and it appears to me that 40 or 50 such sheep imported annually for a few years would do a great deal to change the character, not only of the wool but of the mutton, in such districts as North and South Arcot, Chingleput, Ganjám, Gódávari, Guntúr, Kistna, Madura, Salem, Tanjore, Tinnevelly, Trichinopoly, and Vizagapatam.

Mr. J. M. Lonsdale, Agricultural Expert to the Court of Wards, Madras, points out that a necessary corollary to the importation of foreign rams for the improvement of Madras sheep would be the wholesale castration of inferior males. "The principle of the castration of the inferior multitude for the sake of the superior few" is acknowledged in all countries where breeding receives any real attention, and indeed it may be considered as the *sine qud non* of the art of sheep breeding. It may be pointed out that, as a result of emasculation, a better growth of wool is obtained, and the animals are ready for the butcher much earlier than they otherwise would be.

The initial processes in the preparation of wool for spinning are sorting, washing, picking, teasing out matted portions by hand, cleaning and combing, but all of these are not necessarily employed.

Wool-sorting is in many cases not carried out at all, and is confined to the separation of black from white or coloured wool, or to the picking out of the worst pieces of wool, which are set aside for other purposes, or to be washed, or teased out with the comb, or by the pinjári or wool cleaner.

Hand-picking has to be resorted to in the case of wool grown in tracts abounding in thorny undergrowth, and especially for the removal of "burrs"—a process impossible to carry out in any other way than by careful hand-picking. Badly matted portions are usually steeped and washed, and then torn open if the washing does not open them out.

The pickers are usually women, and wages are very low, often less than 1½ anna per day.

The scutching or cleaning involves the beating and teasing out of the wool. The weavers often do the cleaning themselves, using an ordinary bow, the string of which is made of gut or of some strong fibre.

The bow is held in the left hand with the string partially buried in a little heap of wool, the operator being in a squatting position. The string is caused to vibrate either by being plucked with the right hand, or struck with a suitably shaped piece of wood.

If large quantities of wool are required, the wool is cleaned by a professional bowman, "*dhunia*," "*behna*" or "*pinjari*." [Tam. *panjukotti*, Tel. *dudhikotti*].

The instrument employed by him, known in Urdu as the "*dhenki*" or *pinja*, is a heavy bow, which is suspended string downwards, with the string resting some six inches from the floor.

A pile of wool is placed under the string, which is then depressed until it is well into the wool, when it is let go. The string is made to vibrate violently either by hand, or by being struck with a dumb-bell shaped wooden instrument called in Urdu the "*muttiya*." By its vibrations it opens up the wool, and frees it from all kinds of dirt which is neither very viscous nor prickly.

These professional wool and cotton cleaners are paid at the rate of about three pounds of wool for an anna; if the wool is very foul the rate is higher.

Wool-combing is rarely done in South India, because the staple of the wool is usually too short to admit of its being carried out properly. In the Northern parts of India much

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hill grown wool is "combed," and this is occasionally necessary for the better of the Mysore and Coimbatore fleeces. A block of wood with iron spikes fixed closely together in it is used, the tangled and matted locks of wool are drawn quickly through and over it, and are thus torn apart and set in order by the spikes.

THE SPINNING OF THE WOOL.

Wool spinning is done with the *charki* or common spinning wheel, [Tam. *rattanam*, Tel. *rattanamu*]. It consists essentially of two parallel discs, the circumferences of which are connected by threads. Over the drum so formed passes a driving band, also made of thread, which communicates a rapid motion to the axis of the spindle. An end of wool is presented to the point of the spindle [Tam. *tharsuthum kathir*, Tel. *kandalsuttai soodhi*] which seizes the fibre with the aid of saliva, and so a thread is spun, the yarn being drawn away as the thread forms, as far as the spinner's arm will reach. The thread so formed is then slackened, and allowed to coil itself on to the body of the spindle, until the latter is full, when the yarn is removed in the form of a "kukri", cop or ball.

The process is exactly the same for wool as for cotton, except that in the former case the spindle is larger. Spinning is often carried on with the more primitive instrument named "*dherna*" or "*takli*" in Urdu. [Tam. *murukkum kathir*, Tel. *pendai soodhi*.]

This Shepherd's spindle consists of a fairly heavy wooden base, made of either a turned piece of wood or else of two pieces crossing at right angles, with a wooden axis rising perpendicularly to this base. The diameter of the base is usually about 4½ inches, and its thickness about half an inch, the axis generally about ten or eleven inches long, and a little over half an inch in diameter. Both kinds of *dherna* are much the same in shape. Shepherd's spindles are often made from a stick or piece of bamboo, with a ball of unbaked clay on the lower end.

The raw wool is made up into "*punis*," or coils suitable for winding round the left wrist. The end of the "*puni*" is fastened to the end of the axis of the dherna by inserting it into a small slit in the axis.

The "*dherna*" is then spun round in the hand and, when it has got firm hold of the wool, it is allowed to hang in the air, supported by the thread which it is spinning, the right hand of the operator keeping up the rotary motion, while the left supplies the wool from the coil or "*puni*." "When the thread gets so long as to bring the "takli" out of reach or to let it touch the ground, the movement of the wool from the "*puni*" is stopped, and the length that has been spun is wound on.

The thread produced from the spinning wheel is naturally the stronger and more reliable, owing to the greater regularity of the motion of the spindle. The shepherd's spindle has, however, a great advantage in its portability, and in shepherds and women being able to take it and a supply of wool with them anywhere, and spin a little yarn whenever they have a few minutes to spare.

In Ellore and Masulipatam coarse hairy wool appears to be often made up into a weak ill laid yarn, by twisting it across the thigh. This is apparently only used for the commonest of export rugs; the "cutting off," and consequent unlaying, must take out almost all the twist in the pile yarn. This doubtless accounts for the short lives of some "trade rugs."

There are, in all the carpet districts, a certain number of persons, not weavers, who spin for wages, but their pay is miserably low, as not more than 1½ to 2½ lb. of wool can be spun in a day, and the wage for spinning two pounds of wool is only from 2 to 2½ annas.

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For double yarn laying, the charkhi can be used, and also a form of the *taku* [called in Urdu *masan*], the difference being that the upper end of the spindle is grooved for the reception of the twisted threads.

The woollen thread is opened [*kholai*], which is done as follows:—Two kukris are taken at a time, the ends of the threads are held together, running between two fingers, and the thread is pulled steadily off the kukris. This double thread is allowed to fall in heaps on to the ground, and is then wound into "lattias," hanks or skeins crossed over a pair of sticks, the hands, or on a frame. The wool in these lattias thus takes the form of a figure of eight, and each lattia weighs from $1\frac{1}{2}$ to 3 lb.

"The physical structure of the wool fibre is very characteristic, and enables it to be readily distinguished from other textile fibres. Being a product of the epidermal layer of the skin, it is built up of an immense number of epithelial cells. When carefully examined under the microscope, the wool fibre is seen to consist of at least two parts, sometimes even of three.

"The external cells appear as thin horny plates or scales of irregular shape; they are arranged side by side and overlapping each other, somewhat after the manner of roof-tiles. The upper edges are more or less free, the lower are apparently imbedded in the interior of the fibre. In Merino wool the scales appear funnel-shaped and fit into each other, each one entirely surrounding the fibre. In hair they are more deeply imbedded; they also lie flatter and present but little free margin.

"This surface character plays an important part in causing the 'felting' of wool in 'milling,' etc., and the fining of the carpet yarn in the boiling processes of dyeing. During this and similar operations, in which a large number of fibres are brought into close and promiscuous contact, each fibre naturally moves more readily in one direction than in the other, and the opposing scales gradually become interlocked."

"It is an interesting fact that these disintegrated internal cells possess a greater attraction for colouring matter than the external scales, and the beneficial effect of the acidity of the bath, required in many cases of mordanting and dyeing, may possibly be ascribed to the opening out of the epithelial scales, and the exposure of the inner fibrous cells to the action of the liquid of the bath. This seems to explain also why 'extracted' or 'carbonised' wool dyes deeper shades and more rapidly than ordinary wool.

"When wool fibre is steeped in warm water, it softens and swells up very considerably, and, like all horny substances, becomes plastic, retaining any position which may be forced upon it, if, while the mechanical strain is continued, the moisture is more or less evaporated.

"The worth of any quantity of wool is determined by carefully observing a number of its physical properties, *e.g.*, softness, fineness, length of staple, waviness, lustre, strength, elasticity, flexibility, colour, and the facility with which it can be dyed. Fleece wool, as shorn from the living animal, is superior in quality to 'dead wool,' *i.e.*, wool which has been removed from the skin after death, if lime has been used in the process, but, if it be removed from the skins by cutting, the wool is practically equivalent to 'fleece wool,' indeed it is said to felt better than the latter. Individual dead fibres occur occasionally in fleece wool; they have been forced out by the roots previous to the time of shearing, and constitute the so-called 'overgrown wool.' This class of wool is comparatively harsh and weak, and it is said not to dye so readily as other kinds. This is the case also with the wool of an animal which has died of some distemper.

"*Action of alkalies.*—Alkaline solutions have a very sensible influence on wool, but the effects differ considerably according to the nature of the alkali, the concentration and temperature of the solution, and the duration of contact.

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"Solutions of alkaline carbonates and of soap have little or no injurious action on wool, if they are not too concentrated, and the temperature is not higher than 50° C. Soap and carbonate of ammonia have the least injurious action, while the carbonates of potash and soda impart to the wool a yellow tint, and leave it with a slightly harsher and less elastic feel.

"This marked difference of action between the caustic and carbonated alkalies makes it an all important matter for every wool-scourer to know the exact nature of the agents he uses. Soaps should be free from excess of alkali, "soda ash" should contain no caustic soda, etc.

"Calcium hydrate [lime] *acts injuriously, like the caustic alkali*, but in a less degree. *It eliminates the sulphur from the wool, but thereby renders the fibre brittle.**

"Lant or stale urine is the detergent which has been employed for wool-scouring from the earliest times, and it is effective because of the ammonium carbonate it contains. Though still used, this agent has been largely supplanted by others, such as ammonia, sodium carbonate, soap, etc.

"Stale urine, used in the proportion of one measure to about five of water, gives excellent results in most cases. It leaves the wool clean and with its normal physical properties of softness, elasticity, etc., unimpaired, its disagreeable odour being its main defect. Ammonium carbonate is the most rational substitute for 'lant,' and represents, perhaps, one of the best alkaline detergents, especially if used along with soap; but it is still too expensive for general use. As a mild scouring agent for the better classes of wool, potash or soda soap is largely employed. Satisfactory results are obtained with these if the soap is of good quality, and free from excess of caustic or carbonated alkali. Other things being equal, the most soluble soaps are made from oleic acid. An average soap solution may contain 30–50 grammes of soap per litre of water. An addition of ammonia to the soap solution is frequently made for the purpose of increasing its detergent properties."

"The scouring agent most largely employed, either alone or mixed with soap, is sodium carbonate. When used with judgment and care, it leaves the wool but little affected, and being inexpensive it is well adapted for wools of medium and low quality. The injurious effects of using a calcareous or magnesian water are less marked with this agent than with soap, since the calcium and magnesium carbonates precipitated on the wool are of powdery nature and more readily removed. The presence of *caustic* soda must always be rigidly avoided."—'The Dyeing of Textile Fabrics' by J. J. HUMMEL.

In connection with the foregoing note upon the wool used in carpet weaving, its preparation, etc., the following extract from J. K. Mumford's valuable work 'Oriental Rugs' will be found of interest, as telling something of the preparation of the wool as practised in those older homes of the industry, Persia and Asia Minor.

Wool.—"After the sticks and other foreign substances have been dislodged, the washing and scouring is done. As to the best way of doing this, too, opinions vary widely. In Asia Minor and throughout the Trans-Caucasus the wool is washed many times in cold water, without being allowed to dry between the washings. When cleansed of dirt, and of the natural grease of the animal, it is placed in large granite mortars, called *tubecs*, and covered with a mixture of flour and water, or with starch. The men of the family pound and mix the mass thoroughly, with great wooden mallets. It is then taken out, placed in baskets and in them washed again for two or three hours in a running stream, until the last trace of the starch shall have disappeared. This washing is of scarcely less importance, in the eyes of the Oriental wool-handler, than the delicate operations of the dyers themselves. Much

* The italics are mine.—H. T. H.

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depends upon the quality of the water. Soft water, of course, is the thing sought. Hard water necessitates the use of potash, which cuts the wool.

"The washing over, the wool is exposed to the sun to dry. About this proceeding the Oriental is equally fastidious. A particular degree of warmth, a precise amount of sun, and wind from a certain quarter are relied upon to work a marked superiority in the carpet, and where the wool is intended for fabrics of the first quality, or is ordered for the execution of a *farmaish* [made to order], the wool-worker will wait for weather conditions to his liking. Even in the spreading there is a knack essential to the best results in the finished goods. The drying besides being gradual, must be even.

"Refined by all these processes, the wool is weighed up, preparatory to picking and carding. There is a sad difference between the weight of the fleece as it comes from the shearer, and of the residue after all the days of washing, scouring and drying. About thirty per cent. is lost in actual dirt, and probably thirty per cent. more in animal oil, so that, though the average weight of a whole fleece, newly sheared, is about five pounds, it is a good one that nets more than two or two and a half.

"The old devices for picking or loosing the wool from the mats in which it is left after drying are as simple as they are odd. That in most general use is merely a huge bow, a strong, hardwood pole, seven or eight feet in length, strung with a stout gut. This formidable weapon, subdued to purposes of peace, is suspended by its middle from the ceiling, so that the cord just touches the heap of wool."

"Another invention consists of a solid block, or sometimes a heavy wooden frame, from which protrude upward, in close rows, stiff, perpendicular pins. The native, man, woman, or child, sits on the ground, Turk-fashion, and draws the wool again and again over and between these pins, a process which picks it apart and fits it for the spinning. This method is used only for wool which is of more than ordinary length. It was particularly in vogue until lately in those parts of Anatolia where the material is prepared for working in the heavy modern carpets. [This is often done in India to badly matted wool.—H. T. H.]

"The yarn hand-spun by shepherds, in the open air, is in great favour with the manufacturers, but the supply is small, since, as we have seen, the herdsmen, using only the selected wool, keep the yarns of their spinning for their own carpets. The old-fashioned distaff and spindle are preferred, and the use of a wheel for spinning is as much of a concession as the Oriental will voluntarily make to mechanical progress.

"Attempts have been made from time to time, by European firms, or their Eastern agents, to establish steam mills in connection with their weaving interests at Oushak and in other places. The proposition has always met with a loud protest from the wool-workers of the district, and the Government, in paternal regard for its industry, has refused to lend a hand.

"The yarn which is made in three grades, light for the weft, medium for the warp, and heavy for the piling—though in very fine carpets the light grade is taken for pile—is usually purchased by the firms for which the carpets are being made, and its cost checked up against the master of the looms, to be deducted from the money due on the completion of the work."

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THE DYEING OF THE WOOL.

The great importance of dyeing, as the hand maiden of weaving, is perhaps best illustrated by the following brief mention of the history of the famous Gobelins and Beauvais tapestry factories, and incidentally of the great Savonnerie carpet works. In a small workshop, in a poor quarter of Paris, near the Seine, lived in A.D. 1450 one Gehan Gobelin, member of a family then in great repute as dyers at Rheims. Gehan, by dint of much patient experiment, discovered a particularly beautiful fast-coloured crimson dye, and a very beautiful blue. This family and their dye works prospered, for towards the end of the century we again find record of the Gobelins dye works—now supplemented by weaving; and in 1603 the brothers Jean and Philibert Gobelin, already established in fine buildings in the Faubourg Saint-Marcel, Paris, were joined, by order of King Henri IV, by two Flemish weavers, Marc de Comans and F. de la Planche, and there under royal patronage they inaugurated their tapestry works. From 1603 to this day the dyeing process has been carried on under the same roof as the tapestry weaving, and not only is all the wool for the Gobelin looms still dyed and prepared on the premises, but also that required for the Beauvais tapestry and the Savonnerie carpet works. In 1662 Louis XIV, upon the advice of Colbert, his finance minister, created and subsidized a royal manufactory of the Gobelins works under the title "*Manufacture des Meubles de la Couronne.*" At this time both the high warp process [on horizontal frames worked perpendicularly] and the low [on perpendicular frames worked horizontally] were in use there. A skilled workman in full practice on the high warp loom was able to produce about three square yards of the finest tapestry as an average year's work, the low weaver producing about a yard more in the same time. It is easy to ascertain by touch which of these methods has been employed for the production of any given piece of work; the high warp weave gives a somewhat fuller stitch, consequently the work feels firmer, and is less supple. At the present time only high warp looms are used at the Gobelins factory, those on the other system having been transferred to the Beauvais factory in 1825, many years after their use had been abandoned at the Gobelins.

At Beauvais, Aubusson, and the Savonnerie, the dyeing for a long time had a great deal of the character of old Persian carpet colours, and it was only after nearly a century that French taste began seriously to influence the character of the colouring. During the Commonwealth and the reign of King Charles II, numbers of weavers who had been driven out of France found homes in England and established themselves in Spitalfields, London, and at Mortlake in Surrey, where, long before, King James I had set up looms; which appear till then to have done little or no work.

The thorough cleansing and preparation of the yarn for the dyer is just as important as the dyeing itself, for no good dyeing can be done unless the wool has been put into a fit state to receive and absorb the colour.

The object of the washing or scouring is to remove all traces of grease and dirt, and to make the yarn soft, and absorbent enough to drink in the colour into which it is to be dipped. "The Institutes of Manu" ordain that silks and wools shall always be washed and purified with the saline earths.

The best and simplest method in use in India for this cleansing is as follows:—First soak the hanks of yarn in warm water [at a temperature of about 70° C.], and let it drain after a beating and rinsing in cold water. Then, to 10 gallons of boiling water in an ordinary dyer's copper or dye pot [which should be large enough to allow the wool to be put in without the risk of boiling over] add 4 lb. of crude carbonate or sulphate

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of soda [Tam. *aplakharam*, Hind. *reh*]—that collected as efflorescence from salt-impregnated lands is quite good enough if there is not too much earth in it;—and 8 oz. of sajji, [an impure carbonate of soda and potash, which is got by burning alkali-bearing plants] and boil for a quarter of an hour. The wool in hanks is then entered, kept at the boil, and constantly stirred for at least an hour, or until experience shows that the wool has been well cleaned. After boiling, the hanks should be taken out one by one, and well wrung. As soon as possible they ought to be beaten and washed in many waters, until it is found that the drippings come away clear, then dry thoroughly in the sun.

It is important to remember that washing alone, even in many waters, is not sufficient altogether to take out dirt, grease, or excess colour after dyeing. The removal of these is much facilitated by putting the hanks on smooth stones, gratings or planks, and beating them thoroughly with stout sticks or canes. Several good washings, after this process, will carry off a considerable amount of dirt, grease or unabsorbed colour.

In some factories this beating appears to be done with heavy logs of wood. This to my mind seems most objectionable, as is, I think, anything which is likely to accelerate beyond a certain point the "felting" process in the yarn. The many ingenious mechanical processes in vogue in woollen mills for the cleansing of loose wools and of certain yarns, are all devised with a view to causing as little felting as possible.

It must be remembered that coarse thick yarn will require longer steeping and boiling than that which is thin, and of fine grade wool. Similarly very foul yarn will require a stronger bath and longer pickling than that which is fairly clean.

I have never been able to find any means of removing altogether the stench which is observed in dead, chunam, limed, or butchers' wool, and which is characteristic of carpets made of such wool, especially in damp or wet weather, without rendering the wool so harsh, rough, and brittle that it was only fit for use in the most inferior of carpets.

The treatment suggested by the Superintendent of the Vellore Jail in his note [*q.v.*] will probably remove all traces of smell, but, I believe, must render the wool hard, very brittle, dull and most unreceptive of colour. The "lime steep" is of course what is used for a less period by all the weavers for dead or chunam wool.

For light and delicate colours it is often well to give the wool a second washing. This is done by taking 2 lb. of the fruit of *Sapindus trifoliatus* [soap-nut] or the pods of *Acacia concinna*, crushing them, and boiling for half an hour in 4 gallons of water. Let the temperature fall to about 83° Cent., then enter the wool and leave it for 12 hours, keeping a slow fire under the vat. Take out and wash thoroughly.

Sulphate of Indigo—soluble indigo, sulphindolic acid, also known as Barth's blue, Saxony blue.

Add one part of indigo in very fine powder (this is most important, as the smallest particle of undissolved indigo will seriously affect the evenness of the colour and the dyeing properties of the solution) to three parts of commercial sulphuric acid, strength about 97·5, S. G., say, 1·830, [indigo acid]. Messrs. Parry & Co., at their factories at Marikuppum and elsewhere turn out a good commercial acid, and Mr. Maclure, Mount Road, Madras, is a large importer of excellent indigo acid. The mixture should be thus made:—Have ready a large stoneware jar with a wide mouth and tight-fitting stopper. This should stand in a large vessel full of the coldest water available, to prevent over-heating of the mixture. Pour in the acid and add the indigo powder slowly, stirring all the while with a long wooden rod, until it is thoroughly well mixed with the acid, and is of the consistency of honey. As soon as the mixture cools, close the jar and keep for 48 hours before use. During this time the jar should be in the sun as much as possible. This "*marubba*" keeps well for a couple of months, not longer.

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Wool for dyeing with sulphindolic acid should be very thoroughly scoured, and steeped in a weak lime bath for several hours; it is sometimes so steeped for days. It should then be washed and beaten in several waters, wrung out, and dried. The quantity of sulphate of indigo in the dyeing copper will necessarily depend upon the colour value of the indigo and the shade of blue required, and experience alone can teach this. The bath should be boiling, and be stirred for five or six minutes before the wool is entered. The hanks of wool should be stirred and lifted frequently during the dyeing process. When the colour is right take out the wool, wash in several waters, and dip in an alum bath.

One great advantage of this process, as against the old and excellent, but more complicated forms of sweet and sour "vat," etc., is that there is no waste, for the wool, which has a peculiar affinity for indigo, will, up to a certain point, absorb every particle of colour, and leave the liquor colourless; and that the process is a very simple one. In the United Provinces most weavers dye their carpet yarns by this process. And it is in common use in the bazaars for woollens.

The dyer's acid often used in the carpet industry in North India, which, if made strong enough, is equal to all needs, is thus simply made of crude indigenous chemicals:—

For 1 lb. of acid take—

Copperas	1 lb.
Saltpetre	2 lb.
Rock alum	½ lb.
Sal ammoniac	4 oz.
Arsenic	1 oz.

Or the following—

Saltpetre	8 parts.
Sulphate of iron	8 parts.
Sal ammoniac	2 parts.
Alum	2 parts.

Reduce each of the above to a fine powder, and mix thoroughly; put into an earthen pot with a small mouth, [a little water is sometimes added] and fit to it an empty large-mouthed one, which has been soaked in water for half an hour. Put the pot containing the above drugs on its side on a fire-place, so that the large-mouthed one does not get the direct heat of the fire. Now lute the junction between the two pots with well-kneaded clay, so as to prevent the fumes from escaping. As the pots get hot and the chemicals dissolve, the acid held in vapour will pass over to the pot which is not on the fire. This latter should be frequently and liberally sprinkled with cool water, to keep it from getting too hot, and to assist the condensation. When the condenser begins to cool, and the hand can be laid on it without discomfort, the distillation has ceased. The pot containing the chemicals should be broken, and never be used a second time.

The steam in this process comes from the water of crystallization, which vaporises. Action ensues between the various chemicals, and a crude sulphuric acid, carrying some hydrochloric acid and arsenic as impurities, results. This acid may be concentrated to any desired strength by re-distillation and evaporation.

If it is desired to distil a large quantity of acid, specially strong and well fired pots should be made, the connection between the two pots in such case being made with a stout bamboo tube, which should always slope towards the second pot. This tube may with advantage be covered with old cotton cloths and kept constantly wet.

It is of course better in every way to use good and fairly pure acid, but this, although quite cheap, is difficult to get by rail in the small quantities which the weaver-dyer is able to purchase, living, as he generally does, from hand to mouth.

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In dyeing with lac, cochineal and several other drugs, the above acid is frequently used, alone or with lime juice.

The following dyes were, I am informed, in common use in the Madras carpet weaving centres, Masulipatam and Ellore, and also, I understand, in Warangal. Some of them are still used, all appear to be good.

1. *Deep Yellow.*—For 50 lb. of wool, take 75 lb. of fresh *Butea frondosa* flowers, steep them in warm water, in a vessel sufficiently large to hold them and the wool. When the decoction is cold put in the wool, and let it soak for a day, lifting and moving it frequently. Take out the wool, dry it in the shade, after shaking it thoroughly. Boil it together with 9 lb. of powdered turmeric and 2¼ lb. of alum, until the colour is right. It will loose a little depth by exposure to the air and in drying. After the dyeing is completed soak for a few minutes in a bath containing 9 lb. of fuller's earth.

2. *Ordinary Yellow* is got after the above formula, but the alum should be reduced to 1¼ lb. The fuller's earth bath should be omitted.

3. *A good and fast ferment yellow* is thus obtained, steep the wool in water in which crushed pomegranate rind has been boiled, in the proportion of 3 oz. of the rind to 1 lb. of the yarn. Heat to about 90° C., when nearly cold take out the wool, rinse and shake it out, and dry it in the sun. Steep dried *Butea frondosa* and *Cedrela toona* flowers in water, 9 oz. of each of the flowers to 1 lb. of wool. Let this stand for three days, stirring well occasionally. Strain the liquor through a coarse cloth. For each pound of wool to be dyed add 2 oz. of coarsely powdered lodh [bark of *Symplocos racemosa*] to the liquor. Boil for an hour. Put the wool into the bath and continue the boiling for three hours. Lift and stir frequently. Take out the wool and steep it for an hour in "*sajjimatti*" and water [4 oz. of the earth to each gallon] wash thoroughly, and dry in the sun.

4. *A yellowish almond colour and sulphur and buff shades* can be dyed in the flower bath after the above yellow dyeing, but for these paler tones the final bath in sajjimatti must be omitted.

5. *A very fine yellow* is said to be got by boiling flour sulphur in water, with carbonate of soda and a little finely powdered turmeric [it may be noted here that the firmest and hardest rhizomes of turmeric should be selected for dyeing, in preference to the softer and more easily crushed ones]. The wool is boiled in this bath and afterwards dipped in various alkalis. The deepest yellow is got from a strong potash ley. I think the use of *Cedrela toona* flowers, instead of the turmeric, might be an improvement.

6. *A very fine range of purples* is said to have been thus dyed. Boil in a weak indigo bath, wash and dry. Then dye in a chay root bath, and again wash the wool and dry it. These processes repeated, are said to give a large range of tones of purples and violets, which are of great depth and brilliance. The red dip is often varied by the occasional use of a lac bath, instead of the chay root.

7. *Lac reds*—an old Nellore formula. Take butti lac 3½ lb., tamarind pulp 10 lb., alum 1½ lb., fuller's earth 4 lb., first boil the wool in water to which the fuller's earth has been added. Boil for half an hour, draw the fire. Then take out the wool, and wash it in several waters, until the drippings come away quite clear. Boil the lac in about six gallons of water. Boil the tamarind in five gallons of water, stirring until all the fibre and seeds have come away from the pulp. Strain this liquor off into another vessel, and, while it is still hot, add the alum to it. Now mix the lac liquor with about two thirds of the sour bath. Enter the wool, and boil until it has taken on the shade you require. As the liquor boils away add more tamarind-alum liquor, for the wool must not be allowed to come above the surface of the bath. Lighter shades are got by reducing the quantity of the drugs, especially of the lac. Darker ones by corresponding increases.

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8. *Coppery red tones* are got by first dyeing the wool with *Butea frondosa* and *Cedrela toona* flowers, and mordanting with alum and a little saltpetre. The yarn should be well-washed and dried in the shade. Formula No. 7, is followed for the rest of the dyeing. The red is sometimes varied by substituting chay root for a portion of the butti lac, in this case the dye should be strained before the sour bath is added.

9. *A good red ferment dye* is got as follows. Butti lac is ground with water into a paste, to which is added a quantity of cold water which has been boiled. Boiled flour-paste, of about the consistency of treacle, is now added to the lac infusion, in the proportion of three quarters of a pound of paste to each pound of butti lac. The whole is well stirred for an hour. And the vessel left in the sun for two or three days. Now put the yarn into the vat, and let it steep for from two to three days, or until the colour is right. The yarn should be lifted and well stirred twice a day. When the colour appears to have set right in the yarn, cut off a little, and boil it for a few minutes to test its permanence. If satisfactory wash, and boil fast for a quarter of an hour, in water that has been slightly soured with lime juice, mango rind or tamarind, and to which a little alum has been added. Wash well, and dry in shade. Sun for an hour or two when quite dry.

10. *A good warm brown* is dyed by the use of the following, which suffices for 50 lb. of wool. Fresh *Butea frondosa* flowers 50 lb., sappan wood chips or saw dust 75 lb., turmeric 9 lb. Soak the wool in the *murkan marram* flowers for a day, moving it often. Then dry the wool in shade. Boil with the turmeric and dry again, and finally boil with the sappan wood, to which 1¾ lb. of alum should be added.

Dyeing in Bangalore.—I found it difficult to get much detailed information from the carpet weavers. All admit that they are greatly indebted to aniline colours, but several of the weavers assured me that, for their best work, they use only natural dyes. I saw about a dozen carpets and rugs on the looms, nearly half the colours in these had certainly been dyed with anilines. But the deep blues in all of them were got with indigo. Some of the commonest and worst Italian and Austrian tar colours, which have been made for dyeing cheap cottons, are frequently sold to the woollen carpet weavers!

11. *Blues.*—Only one or two of the weavers dye with indigo. Most of the dyeing is done by several families of dyers in the bazaar, who work only in indigo. One of their methods of dyeing, said to be very permanent, is as follows. For 40 lb. of wool, take 4 lb. each of powdered indigo, and the crushed seed of *cassia tora*, Can., *tegassu bijay*, 8 lb. of "*chawla*" [a local alum impregnated earth, with a little soda in it], and 4 lb. of lime. First dissolve the powdered indigo in a large vessel nearly full of cold water, and stir for an hour. Then add the crushed cassia seed [which should have been boiled in half a pot of water for twenty minutes] and stir thoroughly. Dissolve the alum earth in boiling water, and add it to the mixture. Last of all put in the lime, little by little. [Sometimes the lime is put into the bath first, and the alum-earth last of all]. This vat has to stand for eight or ten days before it is ready for use. The wool is steeped *cold* for an hour at a time, until the right colour has been got. Several dippings will probably be necessary for a deep blue. Mordanting is said to be done with myrabolans, but this does not appear to be at all necessary. The indigo formula given by the Superintendent of the Bangalore jail (*q.v.*) is also followed in the bazaar.

12. *Yellows* of almost all shades are got with *Butea frondosa* flowers, turmeric and alum. With, often, a further dyeing with the flowers of *Cedrela toona*. This, I think, is done after the wool has been washed, dried, and treated with a weak cold vegetable acid bath.

13. *A good dull orange* is said to be got by hot dyeing with equal parts of the dried flowers of *Butea frondosa* and *Cedrela toona*. Two or three dippings are needed, and each dipping should be followed by a mordanting bath of alum and a little pomegranate rind.

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Wash and dip in a weak solution of crude saltpetre. The proportions are said to be ten parts, by weight, of each of the flowers that have been used, to one part of saltpetre. The yarn should be dried after each complete dyeing. For a deep tangerine orange like colour, the wool is often first dyed a pale pink with chay root, or lac colour.

14. *Dyeing red with lac and chay root* are practised, and sour mango cuttings are used as an intensifier.

15. *A deep dark red* is got from sappan wood chips, cuttings or saw dust [*Cæsalpina sappan*]. It is generally used with lac, or chay root, mordanting is done with alum water, with often, after drying the yarn, a final dip in a vegetable acid as a brightener.

16. *Black* is often dyed with a combination that I have not known before. Naturally dark coloured wool is soaked hot, and often boiled, in a mixture of myrabolans and a black slimy mud, which is said to come from a swamp in some rice fields about 30 miles from Bangalore. I was told that almost all the black cumblies made in the Mysore State are so dyed, unless made from naturally black wool. I suspect there is iron in some form or other in this mud.

The Bangalore carpet workers are very careful in the sorting of the different natural coloured wools. A result of this is, that they are able to dye, fairly evenly, grey and brown wools, in many shades for which white wool is used in most other carpet weaving districts. The variety of colours found in fleece wools in the Bangalore market is very considerable, and ranges from creamy whites, greys, and browns to an intense black.

The following recipes for dyeing will also be found useful. Any ordinary shades of colour required may be obtained from combinations and modifications of them. Special attention is directed to the remarks regarding the varying strengths and colour values of dye-drugs which close this section of the monograph.

17. *A good range of browns and deep maroons* is thus got. Boil henna leaves with twice their weight of water. Steep the yarn [which should previously have been dipped for a few minutes in pomegranate rind water, and dried] for half an hour in the hot henna liquor. Repeat this twice or thrice, until the colour is right. Dry, soak for twenty minutes in clear lime water, and dry off in the shade.

18. *Black, Kala Siya.*—To six gallons of water add "bábul pods" [*Acacia arabica*], 6 lb., well burnt clay from old pots, or over-burnt bricks, in fine powder, 10 lb., sulphate of iron [Tam. "*anna bedi*," Hind. "*heera kasis*"], 2 lb. Boil for one hour, *stirring well all the time*, put in the wool and keep the water at a fast boil for three hours. Twist the water out of the hanks on two sticks, and wash *till the water runs away clean.* Shake out well and dry quickly. [All dyes with iron in them kill the wool sooner or later, as witness the fine old pattern pieces of Ellore weave in the Madras Museum.]

19. *Purple, "Sauzni," "Tyriani," "Secunder Badshah-ke-rang."*—To 4 gallons water add 1¾ lb. of very finely powdered "lac colour," boil for one hour, stir well. Now add slowly sulphuric or hydrochloric acid 3 ounces, enter the yarn and boil for two hours; slacken off the fire. Draw nearly all the dye off into another vessel, mix thoroughly with 3 oz. of sulphate of indigo [Tam. *avari*] and 11 oz. of alum [Tam. *padikharam*] and pour slowly down the side of the vessel, stirring the wool vigorously all the time. Or, better still, take off fire, remove the wool, mix in the indigo liquid and re-enter the wool, boil for ten minutes, and keep at a temperature of about 95° C. for two hours. Then draw, wash thoroughly, wring and dry in *shade.* To deepen or vary the colour add more lac, indigo, and alum, in the above relative proportions. Experience is the only possible safe guide here. Sometimes the indigo dyeing is done first, in which case the yarn should be washed, dried and re-wetted before treating it with the lac colour.

20. *Another purple.*—Use blue indigo dyed wool, add 2½ lb. of lac colour to 4 gallons of hot water, pour in 4 oz. of muriatic acid to sour the bath, boil from one to two hours

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A very good lavender colour, and an excellent lilac can be made in this way by watering the liquids, reducing the red and blue, and giving a weak "khar" bath after the wool has been dried.

21. *Light Blue, "Asmani," "Ferozi."*—This is best dyed with wool which has had a second "dhulai" [washing] in crushed soap-nut [rita]. Soak for half an hour in a weak hot alum bath, wash, enter while wet into a bath of 1½ oz. sulphate of indigo, and 8 gallons water, fix in an alum bath, and wash thoroughly, dry.

NOTE.—Always choose a bright day for all indigo dyeing, especially the paler shades. Dry in the shade.

22. *Orange, "Nairang."*—1¼ lb. *lodh* [bark of *Symplocos racemosa*], 4 gallons water. Boil for 20 minutes, then enter wool, boil for one hour; take out and place in a weak warm "khar" bath [1 lb. shell or stone lime to 3 gallons of water]. Boil for 10 minutes, then wash and dry in the sun as quickly as possible.

23. *Green, "Bagh-ke-sabz."*—Dye three times in strong solution of tesu flowers [*Butea frondosa*], then dye with "haldi," adding alum, until you have the tone of yellow you want as the foundation of the green. Then put into a sulphate of indigo bath of the required strength, boil for an hour till sufficient colour has been absorbed, allowing a little for loss in washing, wash and dry. If great brightness is needed, enter into a fresh bath *made properly* with a chrome or alizarine green of the needed shade. Do not boil too long, or you will kill the ground yellow. This tone is very often got by first dyeing in indigo, and then colouring with the "tesu" flowers and turmeric.

24. *Light green, Pea green, Bud green, Grape green.*—Dye to the required shade with indigo [Tam. *avari*] and with alum [Tam. *padikharam*], rinse and dry. Then dye with turmeric [Tam. *manjal*] and tesu flowers as in the foregoing, add a little acid drop by drop, wash, and dry in the shade.

25. *Pale green—"Pistai, Pistaki."*—Dye first in weak indigo bath, wash and dry, then dye with turmeric [*manjal*] and *Butea frondosa* flowers soured with muriatic acid. Wash and dry in shade.

26. *Peacock green, "Deep green," "Mor-ka-sabz," "Tamba-ka-sabz."*—Use only well scoured wool, otherwise the dyeing will be a failure. Afterwards give a khar bath, 1½ lb. stone lime to 4 gallons of water, and wash *very thoroughly*. Dye in a strong indigo bath, and wash well. Take "tesu" [flowers of *Butea frondosa*, Tam. *palor*], 24 lb. to 12 gallons water and "myrabolams" [*Terminalia Chebula*] 6 lb. to 12 gallons water. Boil the "harra" till it has become reduced to half, strain, boil the tesu flowers for half an hour, then add the harra water. Keep hot in this bath until colour is right. [Do not boil it.]

27. *Green, sabz.*—Dye wool in weak indigo bath, put into "pewar" [*Carthamus tinctorius* flowers] water. Dip in a hot bath of turmeric and alum and steep all night. Wring out, and dry in shade without washing.

28. *Olive green, Sabz Khaki.*—5 lb. harsingar flowers [*Nyctanthes Arbor-tristis*] to 20 lb. boiling water, steep all night, squeeze out the flowers and strain, add water till of the right depth, dry in the sun. Take "babul pods," powdered, 4 lb. and myrabolams [Tam. *kaddukai*] pounded 2 lb., mix well in water, and leave in sunshine till it ferments. Then add 8 oz. sulphate of iron [Tam. *anna bedi*], add all to the harsingar water with more water, dip *dry* wool into the solution, and leave till the right colour comes. *Don't boil*, wring only, dry in the sun or in a draught, and shake out well when dry. Don't dye this colour in wet dull weather.

29. *Red, crimson.*—1¼ lb. pounded lac colour, ½ lb. sulphuric or muriatic acid [the latter is the best], 4 lb. sour mango cuttings, 3 gallons of water. Boil, enter yarn, boil for 3 hours, draw wool, wash and wring. Dip in cold water just soured with acid, wring and dry. If great depth of colour is needed, add more lac powder, or give a second dyeing.

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30. *Dark claret colour.*—The formula is the same, but the quantities of drugs are increased as follows:—Lac colour, sulphuric acid, lodh [*Symplocos racemosa*], sour dry mango, of each 1½ to 1¾ lb.

31. *Nutty brown.*—Make two baths with 2 gallons of water each, one of 1¾ lb. dried *Butea frondosa* flowers, the other of the same quantity of myrabolam [Tam. *kaddukai*], steep for 12 hours, then mix and add 4 oz. of catechu, enter the wool and boil slowly for two hours, remove, wring and dry in shade.

32. *Ruddy dark brown.*—Soak 1½ lb. of lac colour in 2 pints of water for 12 hours, add this to 4 gallons of water, stir thoroughly, and add 4 oz. of muriatic or sulphuric acid —the latter is best. Boil for 2 hours, wash thoroughly, wring and boil again in 2 gallons of water with 8 oz. each of pounded lodh [*Symplocos racemosa*], and dry sour mango. Pour off the water and cover until cold, then dry in the sun.

33. *Golden brown.*—Use thoroughly cleaned wool, steep 12 lb. of dry tesu flowers [*Butea frondosa*] in 12 gallons of water for a whole day, stir thoroughly, strain after settling, and enter the wool cold for 12 hours. Remove and drain off the water on a drying frame, wring lightly and dry in the sun, then repeat the whole process. Now boil with lodh [*Symplocos racemosa*] 1½ lb. and catechu 1 lb. in 4 gallons of water for about an hour. Put 4 gallons of water into a large pot with 1 lb. of unslaked lime, stir thoroughly, and enter the wool and the lodh-catechu liquor into it, remove the wool and cover it up till next morning. Wring lightly, and dry in the sun.

34. *Old gold.*—An excellent old gold is got from the above formula by varying the quantities of ingredients as follows:—lodh (*Symplocos racemosa*) 14 oz., catechu 8 oz.

35. *Rich yellow.*—For 30 lb. of yarn take about 25 lb. of the flowers of *Butea frondosa* (Tam. *manjal*), arrange the wool and the flowers in alternate layers in the dye copper, commencing with the manjal, and taking care that each layer of wool is hidden by the flowers before the next is put in. Fill the copper with tepid water [about 40°C.], steep for 20 to 30 hours, then remove and wash the wool well. Into a large tinned copper deg, half filled with water, put in 2 lb. of muriate of tin, stir well and heat to about 90°C. Then enter the yarn, and keep the bath just short of boiling for an hour and a half, stirring all the while. When the wool has taken the required shade remove it, steep it in a saturated alum bath, temperature about 65°C., wash well and dry in the shade. This bath has a good range of colour, which is regulated by the length of the steeping with the tesu flowers and the duration of the boiling in the muriate of tin solution. A good yellow is also got with "akalbir" [*Datisca cannabina*], turmeric and alum.

36. *Pale primrose yellow.*—Steep 8 lb. *Butea frondosa* flowers in 2 gallons of warm water, soak wool for 24 hours, stirring and lifting frequently; dry in the sun. Repeat the process as often as may be necessary to get the desired colour.

37. *Terracotta.*—Put 17½ oz. of powdered lac colour, dissolved in 4 oz. of dilute sulphuric acid, into 4 gallons of boiling water, stir for a few minutes, and enter the wool, adding more of the acid lac solution, remove, and dip in a weak pomegranate rind bath, with a little alum, until you get the desired shade. Wash thoroughly, and dry in the sun.

38. "*Coppery red.*" "*Arab red.*"—Powdered lac 3¾ lb., sulphuric acid 6 oz., water 12 gallons, boil, enter the scoured wool, boil for 1½ hours, boil for ¼ of an hour in a weak pomegranate rind bath, draw, wash. (2) Take boiling water 12 gallons, "manjit" 6¼ lb., sulphuric acid 12 oz., turmeric powdered [Tam. *manjal*] 8 oz., keep stirring well, boil at least three hours. This latter gives a dull yet rich colour.

39. *Strawberry colour.*—Take 1¼ lb. powdered lac colour and ½ lb. sulphuric acid. Add them to 6 gallons of very hot [not boiling] water, boil the yarn for an hour, then wash

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thoroughly and wring as dry as possible. [*b*] Now take 4 gallons of water, 1 lb. each of lodh [*Symplocos racemosa*] and dry mango, bring to the boil, enter the wool and boil vigorously for one hour. Take out, wring and dry in the sun. Pale crushed strawberry colour is got by reducing the ingredients.

The following three formulæ are used extensively in the United Provinces. They are a little more complicated than some of the foregoing processes, but give excellent results.

40. *Red—crimsons, etc.*—Steep the wool and wash in pounded or crushed soap-nut water, steep for 12 hours, wash well and dry. Mix 8 oz. of lac finely powdered and 12 oz. of muriate of tin. Put this into boiling water, stir well, enter the wool; stir till the dye has been absorbed by the wool. Now mix 3 lb. of powdered lac, 2½ lb. muriate of tin and 1½ lb. cream of tartar. Draw the wool and put the mixture into the boiling water, keeping it steadily boiling. Enter the wool again, boil and stir for 2½ hours; take out and wash in cold water until the water runs clear, then fix with alum water. The lighter shades of red are got by reducing the quantity of ingredients. Terra cotta is got by boiling with sulphuric acid and a little lac. With more lac a claret colour can be got with the same formula. For reddish violet, treat as above. Then make a solution of 5 lb. lime to 40 lb. water, drain off the clear lime water and steep wool in it for a few minutes, watching to see that the colour does not go off too much. Any shade from dark-red to violet can be obtained.

41. *Another red* in common use by the dyers of North India is got with myrabolans and the root of the ál plant [*Morinda citrifolia*]. The process is as follows. Steep the yarn for a couple of hours in a hot solution of powdered myrabolans, one part of the drug to fifty of water [temp. about 65° C.]. Wring out the wool, and dip into an alum bath, wring the yarn again, and enter into a strong hot bath of powdered ál root and water. Boil for an hour and a half, dip again in the alum bath, wash, wring and shake out, and dry in the shade. This recipe should also answer for chay root dyeing.

42. *Dark-green.*—Steep the wool in weak lime water, wash and dry. Steep and weight the wool for 12 hours in a hot bath of finely powdered turmeric [Tam. *manjal*]—[6 lb. turmeric to 40 lb. water]. Boil with sulphate of indigo [Tam. *avari*] until the required shade is got, and after wringing wash in an alum solution. Lighter shades of green can also be got with this recipe, using less indigo. Often the indigo dyeing is done first, and the green got with turmeric [Tam. *manjal*] and safflower [Tam. *kasumba*]. In this a bath of vegetable acid, such as mango pulp or tamarind, is used to kill the alkali and fix the colour.

43. *The barberry* [*Berberis*] grows in the Nilgiris, and is said by Leschenault de la Tour to be known there as "*jackalow*." It is the yellow wood ["Barbary wood,"] of the European dyers, and the *dar huld* of the Persian dyers. Both root and wood give a rich yellow dye. It is usually mordanted with a vegetable alkali and then cleared with vegetable acid.

44. *A fine deep and permanent red* is got with manjit. The wool is first steeped, cold, in a strained decoction of oak galls or myrobalan, dried, and then entered to a hot madder vat. Mordant with alum. Chay root would doubtless give a good red if used as above.

45. *Lac gives a beautiful scarlet* rivalling cochineal, if the vat is worked with muriatic acid and mordanted with a "tin spirit." It is said by Dr. McLeod to give a brilliant scarlet, if the lac is first digested, warm, with an alkaline solution of the leaves and stalks of *Memecylon tinctorium*, and the wool, after a first mordanting in a "tin spirit," entered to the hot lac decoction.

A number of other useful dye formulæ will be found in Mr. Cloney's notes on the industry in the Vellore Central Jail, and in those by Dr. P. S. Achutya Rao of the Bangalore Central Jail, Mysore State.

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Below will be found a number of dyer's instructions from an old manuscript book. The dyer who owned it said that they had been copied from an old Persian book of dyes and dyeing directions, which had belonged to his grandfather. He claimed descent from twenty generations of dyers, who originally came from Tabreez in Persia.

It will be noticed that no quantities of either dye-drugs or water appear anywhere. Hence it is clear that the recipes were intended for an experienced dyer, who, knowing the nature and colour properties of the drugs, could, without much trouble, secure the colour indicated, and in the shades needed for his work.

I have tried several of these recipes. It took a good deal of time to get the right proportions, but the results were well worth the labour. I am sorry to say that I have mislaid the notes I then took. All were quite as fast as the majority of other Indian dyes.

All the drugs and chemicals should of course be well powdered or crushed, the finer the better. For the steeping of drugs a good deal of water should be taken, enough to much more than cover them, and the liquor should be very often stirred unless the duration of the steeping points to a ferment dye, in which case the stirring should not be allowed after the first few hours. The wool in the "cold pot" must be frequently lifted and stirred. The direction to "cook" of course means to boil. During boiling, the wool should often be stirred and lifted, so as to give each hank of wool its fair share of dye, and to secure evenness of colour.

46. *Almond colour.*—Take oak galls, *Quercus infectoria*, kadukkai in *Tam.*, karakkaya, *Tel.*, [myrobalan should be a fair substitute.—H. T. H.], dry skin of the pomegranate, Indian madder [*Rubia cordifolia*], soak for 12 hours, put in some alum, and steep the wool for a day and a night. Let the pot be in the open and uncovered, cook it for 3 hours and wash with a beating, dry in the shade.

47. *Birbuls' blue.*—Take cinnabar, indigo and alum, grind and sift finer than the light dust of the high hills, soak for ten hours, keep stirring it, put in the wool and soak for many hours. Boil for three hours, wash in curd water, water in which curds and whey have been well beaten up, leave for three hours, and then wash and beat again in water. [There was an old Persian custom of washing the dyed yarns in fresh milk and water to which certain drugs had been added. This gave brilliance to the colour and a rich deep gloss or bloom. Curds in water were used with a similar object. And valuable old carpets that have been washed and "restored", are said to be treated with milk in which some drugs have been dissolved, but the secret is in the hands of a few Persians and Armenians who keep it to themselves—H. T. H.]

48. *A fine Indigo blue.*—Take indigo, soak it in water for 12 hours, grind it to a fine paste in a mortar, add some *Terminalia citrina*, pomegranate peel and alum, and mix thoroughly. Boil, put the wool into the hot bath and keep stirring till cold. Now mix in some iron filings-water and boil steadily for another two and a half to three hours. Wash with a beating, and dry.

49. *Ruddy brown.*—Take seed of *Cupressus sempervirens*, bark of *Terminalia belerica* (tanikkai—*Tam.*, tandrikaya—*Tel.*)—[*T. Chebula* or *tomentosa* might answer—H. T. H.], oak galls (or myrobalans) and soda. Soak two hours in hot water, steep the wool for twenty-four hours, afterward boil for three hours, add some hot alum water, and boil for one hour. Wash very nicely, and dry in shade.

50. *Ruddy brown-grey.*—Take sulphate of iron, *Terminalia citrina*, oak galls or myrobalans [masikkai—*Tam.* and *Tel.*] and alum, mix well, dry, then steep for twenty-four hours. Put in the wool, soak it for 24 hours, then boil for two or three hours. Dip in a soda bath, wash and dry.

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51. *Camel colour, fawn, pale browns.*—Take pomegranate rind [madalai—*Tam.*, dalimba—*Tel.*] *Rheum Moorcraftianum*, babul [*Acacia Arabica*—karu velam—*Tam.*, nallatumma—*Tel.*] seeds and pods, and soda. Soak for an hour and a half in hot water, steep the wool for thirty-six hours, then cook for two hours, add the alum, and cook again for an hour and a half. Wash very well fifteen times and dry quickly.

52. *Cinnamon.*—Take oak galls [myrobalans should do as well], Acacia bark, cinnabar and alum, and steep for a night. Put in the wool and soak for twenty or thirty hours, boil the wool for two or three hours, and give a soda bath. Wash, dip in acidulated water, and wash again with beating.

53. *Crimson.*—Take lac colour, and cochineal. Steep for from four to six days in the sun, in hot weather for the lesser time, stirring constantly till a rich deep colour comes when some has stood a few minutes in a thin glass bottle and settled. Then strain through two cloths, and put in pomegranate rind and good iron filings-water. Add mineral acid, steep wool for thirty-six hours, then boil for three hours, wash well and dry.

54. *Pale green.*—Take *Datisca cannabina*, turmeric, pomegranate rind and iron filings-water. Let these soak for twelve or fifteen hours, then put in the wool and soak for a day and a night. Now take out the wool and add to the bath indigo and alum separately; return the wool and boil for two and a half hours. Wash with beating and dry in shade.

55. *Pale greyish green.*—Take copper rust, asburg [Stavesacre, the flowers and stalks of *Delphinium zalil* or *saniculæfolium*, see No. 57] and alum. Mix well with very hot water, not boiling, soak wool for eighteen hours, then boil for three hours. Give a bath with water acidulated with sour limes, and dry in shade.

56. *Yar Khans' green.*—Take turmeric, pomegranate rind, *Datisca cannabina* and iron filings. Soak all night, steep the wool for a day and a night in the open air, take out the wool, add first some alum and then nil-ka-marubba [sulphate of indigo] to the bath. Stir well, boil the wool for three hours, or till colour is right, wash fifteen times with beatings, and dry in shade.

57. *Old gold and rich yellow.*—Take turmeric and asburg, [Stavesacre, the flowers and stalks of *Delphinium zalil* or *saniculæfolium*, a little herbaceous plant found on almost all the small low hills of the Himalayas between the Jhelum, the Sutlej and the Indus. This colour is also available, under the same name, in lumps, and as a coarse powder which comes from Afghanistan. As the colour is richer and fuller than that got from the plants, it is likely that the Cabul drug contains some other ingredient. With alum as a mordant asburg gives a very fine and fast dye—H. T. H.], cinnabar and alum. Soak all night, steep wool for twenty-four hours, boil for four and a half hours, wash with a beating, and dry in shade. [Several dippings in asburg are needed for deep tints H. T. H.]

58. *Pearly grey.*—Take soda, *Nyctanthes Arbor-Tristis*, [*parijatham* in Tam. and Tel.] and *Butea frondosa* flowers, soak for twelve hours, and steep wool for twenty-four hours. Then boil for three hours, wash, dip in alum bath, and dry in shade.

59. *Dark Grey.*—Take of the fruit of *Cupressus sempervirens*, seeds and seed pods of bábul [*Acacia arabica*], iron filings-water, and alum, steep for one night. Now add the wool and let it soak for twenty-four hours, then boil for two or three hours until the colour is right, then wash and dry in the sun.

60. *Silvery Grey.*—Take seeds and pods of bábul [*Acacia arabica*], bark of *Terminalia belerica* [*T. Chebula* or *tomentosa* would probably answer as well—H. T. H.] and tamarind, mix and steep for a night. Dip wool for twenty-four hours, boil for an hour and a half, rinse and wash in weak lemon or tamarind water, and dry in shade.

61. *Pearl colour* [also silver and old silver with slight variations of quantities].—Take bábul [*Acacia arabica*] seeds, *Terminalia belerica* [*T. Chebula* or *tomentosa* might answer

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as well—H. T. H.], tamarind [*Tamarindus indica*], and fine white lime, steep these for a day. Then dip the wool for 24 hours, cook for a couple of hours, make an acidulated water bath and dip. Then wash and dry. [Add a very little lac colour or manjit in another bath if a glow of red is needed in the grey, or a very little indigo for blue, or both for a purple or a violet grey—H. T. H.]

62. *Rose-colour.*—Take ratanjot [*Onosma echioides*], a thought of cochineal, manjit [*Rubia cordifolia*) or lac colour a very little, and cinnabar. Add water, soak them for 12 hours, put in wool and steep for 36 hours, cook it for three hours, then bathe the wool in alum, and wash nicely, afterward dry in the shade.

63. *Persian Scarlet.*—Take lac colour, and, if you choose, a little cochineal for richness, and soak from four to six days; strain it in two cloths and add alum, and a little turmeric; let it stand three hours. Put wool in and steep 24 hours, then boil for two hours. Take out the wool and add mineral acid; re-enter wool and boil an hour more. Wash fifteen times when cold, and dry in the shade.

64. *Saffron Yellow.*—Take turmeric, cinnabar and soda, add water, and keep for a full day. Then add some alum, make the dip and soak the wool for 30 hours, cook it for several hours, and dry in the shade after beating and good washing.

65. *Brownish Pale Yellow.*—Take flowers of *Cedrela Toona*, cinnabar and turmeric, soak for a day and night, add flowers of *Nyctanthes Arbor-tristis*, soak the wool for the same time, keep the bath well stirred from the bottom, and lift the wool very often. Put in alum and boil for three hours, wash and dry in shade till nearly dry, then put into the sun.

66. *Deep Dull Yellow, Yellow Brown.*—Take oak galls [or myrabolans], rewand, *Rheum Moorcroftianum*, and pomegranate rind, and soak for a night in water. Then steep the wool for 24 hours, add lime and sulphate of iron, and boil for two or three hours, wash thoroughly and dry in the sun.

67. *Rich Yellow.*—Take asburg [see Nos. 55 and 57] and turmeric, soak for a night in water, steep the wool for twenty-four hours, add alum, shake out and dry in shade.

68. *Mixed red and black*, blue and black, yellow and black, and green and black yarns, are got by spinning together and dyeing equal parts of black and white wool. This is scoured in the ordinary way, and the white wool in the yarn dyed by almost any of the foregoing processes. It occasionally happens that the black wool takes on a tinge of the colour. This, for red and black, is said to be avoided by the following treatment. Mix finely powdered lac colour with water, add barley gruel to it, and stir well until the gruel is well mixed into the water [rice gruel would probably serve the purpose equally well]. Keep this for a few days, or until it takes on a distinct reddish tinge, then stir the bath thoroughly, enter the wool, and stir again for half an hour, lifting the yarn often. Leave it until the wool has taken on some colour, then wash well, and put into a bath of lodh [*Symplocos racemosa*] and dry unripe mango, and boil. When the colour is right, remove from the fire, and leave it until the liquor has cooled to about 60° C. Then wash the yarn thoroughly, and dry in shade. Variants of these colourings are got by spinning together equal parts of white and brown or grey wools, and dyeing as described above. In woollen mills loose wools are dyed separately, and mixed coloured yarns made up as needed. This is much the simpler process, but there is doubtless good reason for the old weavers' way.

I have got some fast and useful dyes in shades of fawns, and reddish and yellowish browns, from padaukwood, jackwood and rosewood sawdust, and using myrabolan or alum, sometimes both, as mordants. A great deal of sawdust is needed to get a good colour. It should be steeped cold for 12 or 14 hours and frequently stirred. Then put on the fire and boil for an hour. The liquor should be strained off when cold, and boiled up when needed

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for dyeing. The wool should be wet when entered. Add the mordant to the boiling wood-liquor bath a little at a time, and boil all together for about two hours. Sappan wood, Brazil wood and logwood are also useful dyes, both alone and in conjunction with other tinctorial drugs. The mordanting should have careful attention.

Dye baths which contain turmeric in large quantity should not be heated above 60° C. In using this drug the hard firm rhizomes, which carry the richest colour, known to Hindostanee dyers as *lok-handi-ka-haldi*, should be carefully selected in preference to the soft easily crushed ones which are best used as condiments. Before powdering the drug it is well to steep the rhizomes in a weak lime juice and alum bath for 24 hours, borax is much better, but is more expensive than alum.

Alum is of special value to the dyer, and it is not made as much use of as it might be. It is often advisable to boil clean wool in a weak solution of common alum, with or without a little mineral or vegetable acid or cream of tartar. Apparently an insoluble compound of alumina is formed in the wool, and becomes a basis upon which many tints, especially the lac colours, are well dyed. The yarn should be dried in the sun after this dip.

It is sometimes found necessary to add to the dye stuffs in a vat full of yarn. In such a case it is advisable to take out the wool, and put it into a clean vessel while the drug is being added. If colour is added to a vat "in work," there is always a risk of the wool on top taking up excess colour.

Carpets are sometimes made without any dyed wools being used in them. Natural blacks, browns, rufous shades, greys, drabs, fawns, buff, and yellowish and creamy tinted wools, are carefully hand-picked, sorted, and spun into yarn. Handsome uncommon looking carpets are made from these natural coloured wools. They are cool looking, restful, and quiet and low in tone. But the hand-picking and sorting give a good deal of trouble, for they need a fair idea of colour in the sorter, and careful watching. Weavers and firms in the trade are not very keen in canvassing for orders for such carpets, although the absence of any dye means an appreciable saving. The wool for this class of carpet is usually washed "in the loose," and then spun into yarn, this being afterward further cleansed with soap nut. In the making of decent class "undyed" or "natural" carpets the "lime steep" should never be used, because it sometimes affects the colour of the wool, for this reason such carpets should never be made from chunam wool.

I have purposely avoided any mention of the processes followed in the use of aniline, alizarine and chrome-alizarine colours.

Reiman, in his 'Hand-book of Anilines,' tells us that, when aniline colours began to appear on the market in 1860, blues and the "fearful magenta" were the first to be introduced. "Less than a year afterward it took ten factories in Germany, Italy, Switzerland and England to produce these colours.

"Whilst the manufacture of aniline colours thus became European, their consumption spread still farther, and now could be observed this unique fact in the history of commerce the West supplied the East with colouring matter, sending its artificial dyes to the confines of the globe, to China, to Japan, to America and the Indies—to those favoured climes which up to the present time had supplied the manufactories of Europe with tinctorial products. This was a veritable revolution. Chemistry, victorious, dispossessed the sun of a monopoly which it had always enjoyed. . . .

"The reduction in the price of aniline colours is such that all manufacturers who use colouring matters have found it worth while to replace their former tinctorial products by these artificial colours. Besides this, the employment of these products has greatly simplified the formerly very complicated and costly operations and processes of dyeing, so that an apprentice can obtain as good shades as a skilled workman. This facility of application has

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certainly not less contributed to the success of coal tar colouring matter, than the richness and variety of the shades.

"Everything, therefore, leads one to imagine that ultimately the natural will yield entirely to the artificial colouring matters. THIS REVOLUTION, the influence of which will be most important, since it will liberate for the production of food many hands now employed in industrial operations, WOULD ALREADY HAVE TAKEN PLACE IF THE ARTIFICIAL COLOURS HITHERTO DISCOVERED WERE AS SOLID AS THEIR RIVALS."

Of anilines there is little good to be said. Some of them are quite fast in cottons, and a few hold well in wool. But none of them, no matter how skilfully applied, are sufficiently fast to light or time to render them fit for use in decent carpet-weaving. Besides this, they usually fade most irregularly. Greens go off in a very short time into dirty looking brownish-greys and dull uninteresting greeny yellows, often flecked or spotted for a time by small patches where the colour has taken firmer hold. Reds go off to dull red-browns, or to undefinable pinky-reds, and the tips of the wool often show white in places. These fadings of course seriously affect the whole colour-scheme in which the carpet was designed.

It appears practically impossible to do anything to stop the use of the common aniline colours. Good indigenous dyeing requires care in the selection, as well as in the use of drugs and dye-stuffs, which are often difficult to get, especially in the small quantities in which the ordinary impecunious weaver is able to purchase them. Every village shopkeeper has a range of the cheapest and worst anilines, at prices varying often from six to ten annas the pound tin, and all the weaver-dyer has to do is to purchase a few ounces or a tin of the colour he needs. A pot of boiling water and some vegetable acid, alkali or alum does the rest, and the dyer has thus at hand all the material for the colouring of a carpet in as many tints as Joseph's coat.

The alizarine and chrome-alizarine colours are many of them quite as fast as, or faster than the old vegetable ones, but their proper use needs a certain amount of skilled training, the possession of exact scales and weights for getting out very minute quantities, and a certain number of fairly pure European drugs. Used improperly, these alizarines are probably worse in their power to change and disappear than are the commonest of anilines.

Many of the best of these colours have not been on the market long enough for one to be able to decide whether their "ripening," or fading, is likely to be in the direction of "softening down," as is the case with most of the old vegetable colours. With the fade-results of the anilines before one it is difficult to say just what will happen. Some years ago I dyed a little wool with high-class chrome and alizarine dyes, and in five or six colours. The darker tones stood exposure to sun and dew for three months quite as well as wool in similar shades, dyed with the old drugs. The paler tones "went off" much faster. In some cases the fading of the chemical dyes was in the same direction as the old colours, but in a few others weather completely changed the character of the colour.

The high grade synthetic indigo which I exposed to the same test, along with some good Behar indigo, did its fading just as the Bengal indigo did, and, the yarns being from the same hank, it was only the labels that showed me which was which.

In closing the Section on dyeing I would invite special attention to the fact that, in dealing with these indigenous dyes, and crude unpurified minerals, much latitude is necessary.

Both indigo and lac colour vary considerably in quality, richness and the amount of colour they give up, and it may very often be necessary to increase or reduce considerably the quantities mentioned in the recipes. By lac colour I mean the cake colour from *Coccus lacci*, or "butti lac." It is got by straining, and the evaporation of the infusion which remains

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after the washing out of the stick lac in the process of making shellac. It gives quite as good colour results as does the fresh lac, and is much less troublesome to prepare. Similarly turmeric, lodh [*Symplocos racemosa*], tesu or porasam flowers [*Butea frondosa*], mango acid, myrabolans, manjit [nunám or chay root], and almost every other dye drug and indigenous mordant, varies greatly in quality. The conditions under which they have been plucked or cut, or dug, the soil in which they were growing, the manner of the drying, and the weather at the time of drying, are all factors which seriously affect their tinctorial value, and have to be considered and provided for. So, as I have said before, it is necessary to use these drugs with discretion. "Festina lente" and "Experimentum docet" are both mottoes which should be graven in every dyer's memory.

There is in existence a bulky lithographed Persian book, in which many details are given for old fashioned Persian dyeing. I think the Government of India might well obtain a copy, and have it translated into English and Urdu. The assistance in the translation of someone with a knowledge of Persian and also of the old fashioned, and usually unscientific, methods of getting these beautiful and permanent results, would be a desideratum.

There is no doubt that the work of the old Indian carpet dyers was almost as permanent and rich toned as that of their Persian compeers, for the processes and drugs must often have been nearly identical. The Emperor Akbar started the Royal Carpet Factory at Lahore about 1580 A.D., with master dyers and weavers from Persia. And there is definite evidence that many of the beautiful carpets which are amongst the treasures of H.H. the Maharájah of Jaipur, were made in Lahore quite early in the Seventeenth Century. The magnificent portfolio on 'Asian Carpets in the Jaipur Palaces,' in which Col. T. H. Hendley, C.I.E., I.M.S., [retired], has so sumptuously illustrated these truly royal products of the looms, shows how, in spite often of neglect and hard wear, most of these old carpets have withstood the attacks of time. Some of them have mellowed and ripened to a wonderful softness and delicacy, while the colours in others are still fresh and brilliant. At Ahmedabad are two or three very old carpets, which came from the Lahore factory. And some of the fine old carpets at Bijapur were undoubtedly made in the same factory. That the Jaipur carpets are in much better condition than those at Ahmedabad and Bijapur, is doubtless due to the dryness of the air in Rajputana.

John Baptista Tavernier, the French gem trader, in his 'Voyages through Turkey into Persia, and the East Indies,' [*Paris*], 1652, thus writes of the textile arts in Southern India—"The collourings of those carpetts which are made in India, do not last so long as the collours of those which are made in Persia; but for the workmanship it is very lovely. The eye of the Broaker is to judge of the largeness, beauty and fineness if those carpetts which are wrought with gold and silver, and see whether they be fine and rich. 'Chites' or painted Calecuts, which they call *Calmendar*, that is to saye done with a pencill, are made in the Kingdom of Golcondah and particularly about Masulipatan. . . The chites which are made in the Empire of the Great Moghul are all printed; and nothing so beautifull; neither for the figures and the collour, nor the fineness of the linen."

In his valuable work on 'Oriental Rugs' [probably the best general description of the Persian and Turkish Carpet Industry that has yet been written], Mr. John Kimberly Mumford tells of the immense number of plants which the Persian dyer brings to his aid. The narrative is so interesting and instructive, that I have ventured to extract a good deal from the Chapter upon 'Dyers and Dyes.' The methods of using many of the dye-drugs mentioned appear to have been altogether lost by Indian dyers.

"In parts of Persia and India dyers habitually wash the yarns in a solution of lime before applying the dyes. The object of this is to increase the brilliancy of the colours, but its principal effect is to make the yarn brittle, and materially lessen its wearing quality.

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Where this treatment has been applied, an expert can usually detect it by feeling the pile of the rug.

"The distinctive feature of the old Eastern dyeing system was that nearly every tingent was of vegetable or animal origin, and that similar ingredients were employed for mordants or fixatives. The treatment of the yarn, with borax, saltpetre, tartar, copperas and the like, was not known. The native dyers held to the merits of the old fashioned mordants—valonia, pomegranate-rind, sumac, divi-divi, and the barks of different trees from which they had for so long obtained such renowned results.

"The best expression of the dyers' skill is undoubtedly found in reds. In what apparently contradictory colours the yarns are dipped, to lay a foundation for the ultimate shades of red, is past finding out. Madder, the root of *Rubia tinctorum*, ground and boiled, is a basis for a multitude of the reds of the Eastern carpets. [Manjit, nunám or chayroot, and Indian madder, come from sister plants.—H. T. H.] Its flowers, too, are steeped, and the liquid made from them fermented, to secure some extraordinary shade of this colour. The red most common in Persian fabrics is made by combining alum water, grape-juice and a decoction of madder, and drying the yarn in a particularly moderate sun. Many degrees of redness, from pale pink to intense and glowing scarlet, can be made from madder alone, by different treatments, and in combination with other materials it plays a part in half the hues which appear in Eastern carpets. One of the oldest Oriental dyes is sheep's blood, from which, by secret method, a rich and enduring vermilion is obtained.

"Another material for deep red is kermes [lac colour from *Coccus laccus*—H. T. H.], a variety of Coccus insect found upon oak trees about the Mediterranean. The normal colour produced from it is a rich carmine. It is one of the oldest Oriental dyes, but it has been supplanted, in a measure, by the Mexican Cochineal, which, after the conquest of Mexico, and the importation of its product into Spain and thence into the Orient, took its place as an Eastern dye. This is used for the most flaming reds, as well as in combination with other materials to give quality to tamer shades. It is more brilliant than the native kermes, but, the Eastern dyers say, not so permanent. With the old vegetable mordants, it produces a comparatively fast dye. In dilution with madder it provides scarlet, cherry, and various degrees of pink. There is a mineral kermes, an artificial sulphite of mercury [said to give shades of great beauty, but to kill the wool in a short time—H. T. H.], which borrowed its name to fit its brilliant colour, and is not to be confounded with the insect dye. In recent years, many reds have had for basis the dye-woods—Campeche wood, Brazil wood and others—which have been engrafted upon the Oriental system. Rich pink shades are often had from the rochella or orchil, a lichen which grows on the rocks around the Eastern seas. [Possibly to be found on the Indian coasts—H. T. H.] Singular reds are also obtained from onion skins, ivy berries, beets, and a multitude of other plants, of which only the dyer knows the secrets.

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"The principal yellows are obtained from Persian berries, which although they are indigenous to Asia Minor, attain a greater size and a more pronounced yellow colour in Persia, from turmeric, and from saffron and sumac roots. The turmeric yellow is not of itself a thoroughly fast colour, but imparts a life to other shades when used in combination. It serves as a mordant for certain dyes, and owing to its instant change to brown, when brought into contact with any alkaline substance, is used in chemistry as a test for alkalis. Some yellow shades are produced also by combination of the wood dyes, and saffron roots and flowers, and a variety of ochra plant.

"Indigo, in combination with the yellows, furnishes most of the greens used by the old native dyers. With the buckthorn, or *Rhamnus*, it produces the Chinese green, and with turmeric and the Persian berries, a wide range of intermediate greens, both bright and dull.

"The deepest shades of brown are obtained by dyeing with madder over indigo, as the deep Persian blue is secured from applying indigo over pure madder—wood brown and camels' hair brown result from the use of madder with the yellows. In Anatolia, this has been accomplished lately by use of the * orange aniline colours. Gallnuts also enter largely into the making of the browns.

"The densest blacks, which are little used except for outlining patterns, and defining border stripes, are made chiefly from iron filings, with vinegar and rind of pomegranate, and sometimes with the addition of Campeche wood. Grey shades are secured by the use of Smyrna gallnuts.

"The schedule of purples is one of the richest in the whole realm of Eastern dyes. The different red ingredients mentioned above are used in combination with indigo, and the dye woods and the *Rochella tinctoria* play a large part. The thoroughness with which the Oriental dyers have canvassed the whole field of substances to discover a new material for establishing or modifying colours is shown in the combination for a popular shade of violet. It starts with a mixture of milk and water, in exact proportions, then madder is added in certain dilution, and lastly, the whole is converted by sour grape juice. A great many shades of purple, heliotrope, lavender and the like are secured from the bodies of marine insects and molluscs.

"This outline will serve to indicate the honesty which dominates the old Oriental colouring. It can only suggest the great variety of materials employed, and the consummate skill required in the blending. Vine leaves, mulberry leaves, myrobalans, laurel and angelica berries, artichokes, thistles, capers, ivy and myrtle—all things that grow within the ken of the dyer—have been tried to their utmost as possible colour-makers and colour-changers. Many of the growths are cultivated by the dyers upon their small acreage, in the intervals of their momentous labour in the shops."

S. G. W. Benjamin, in his 'Persia and the Persians,' says—"It seems strange that processes should be lost for producing articles, by a people who actually continue to manufacture without interruption the very objects into which these processes enter . . . . There never has been a time, for ages, when the Persians have not been manufacturing rugs, during all which period they have been manufacturing their own dyes; and yet, within forty or fifty years, the secret of making the superb blue colour which distinguishes the finest examples of old Persian tiles, illuminated manuscripts and rugs, has fallen into disuse, and no one seems now able to reproduce it."

* The beautiful brownish orange dye of the Bangalore Central Jail, is produced from a combination of indigenous and chrome-alizarine dyes.—H. T. H.

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Some Dye Plants and Vegetable Drugs.

No.	English name.	Botanical name.	Vernacular name.	Dye Properties.
1	Bastard teak	Butea frondosa	Hind. Tasu or dhak flower. Tam. Palasan or murukkan. Tel. Moduga. Can. Muttuge.	Yellow to reddish orange, got from flowers only. Often used with other drugs, as catechu and lodh.
2	Turmeric	Curcuma longa	Hind. Haldi ... ... Tam. Manjal. Tel. Pasupu. Can. Arisana.	Dried rhizomes. Gives a golden yellow, or red to brown with alkali. The hardest and firmest rhizomes should be selected for dyeing.
3	Pomegranate rind ...	Punica Granatum ...	Hind. Náspál ... ... Tam. Madalai. Tel. Dalimba Can. Dalimbe.	The rind of the fruit is generally used as a mordant; has some yellow colouring matter; contains much tannin; much used as a colour concentrator, and in fixing many dyes.
4	Indigo	Indigofera tinctoria ...	Hind. Nil ... ... Tam. Avari. Tel. Aviri or Nili. Can. Nili.	Very largely used in dyeing, gives fine blues, and when mixed with other drugs, many other colours. Colour obtained by a fermentation process from the whole green plant.
5	A'l root	Morinda citrifolia ...	Hind. A'l ... ... Tam. Nuná or manja pavattai. Tel. Maddhi. Can. Maddhi.	Dried root. Gives a good deep dull red colour; mordanted with alum. Might be more frequently used in wool dyeing.
6	Indian madder ...	Rubia cordifolia ...	Hind. Manjith ... Tam. Manjishtai. Tel. Sirinjivéru. Can. Manjista.	Colour from root and small twigs. Colouring principle is purpurin and munjistin. Is fairly well mordanted with all alkalis and alum; is an excellent crimson. Gives a fine scarlet and glowing crimsons with tin mordants.
7	Safflower	Carthamus tinctorius ...	Hind. Kusum ... .. Tam. Kusumba. Tel. Agnisikha or kusumba. Can. Kusumba.	Contains two colouring principles, red, which is the base colouring of the flower (carthamin), and the other an unnamed yellow substance, which is removable by washing the bruised flower in water. The red is dissolved in alkalis, and precipitated by acids. Rarely used for wool dyeing, not very fast.
8	Sappan, sappan wood...	Cæsalpinia Sappan ...	Hind. Bakkam. Tam. Varathangi. Tel. do. or bakamu. Can. Pathangee.	The wood, in chips or powdered, is boiled in water. Mordant alum, with often turmeric or lodh, colour a good dull red, is used with other drugs for various colours, frequently with lac or madder.
9	Red cedar	Cedrela Toona	Hind. Tun .. ... Tam. Tunu or sendana-vembu. Tel. Nandi. Can. Noge or devadari.	Flowers give a good yellow, fairly fast. Often mixed with turmeric. Vegetable acid, alum or lime are added to the decoction, and give greater permanence to the colour.
10	Catechu	Acacia Catechu	Hind. Kattha ... ... Tam. Kasukatti. Tel. Kachu or kancha. Can. Cutch or kachu.	Colour got by boiling the soft wood. The commercial extract is sometimes used in India. Lime and nitrate of iron are good mordants. Gives good brown shades. Is itself a mordant.
11	Myrobolan, gallnuts.	Terminalia Chebula ...	Hind. Hana ... ... Tam. Kaddukai. Tel. Karakai. Can. Alalè or hirada.	Rind of the nut is used for dyeing, is a fairly good mordant (whole nut) crushed. Gives brown with catechu, yellow with alum, grey and black with iron sulphate, and soft dull greens with turmeric and indigo. Used in dyeing with Indian madder and sappan wood.
12	.....	Phyllanthus Emblica ...	Hind. Doula ... ... Tam. Nelli. Tel. Usirika. Can. Nelli.	Often used as a mordant. Gives a fairly good black with sulphate of iron.
13	Lodh	Symplocos racemosa ...	Hind. Lodh	A good mordant for many dye drugs, specially lac, turmeric, and Butea frondosa. Is usually supported by other alkalis.
14	Jack tree	Artocarpus integrifolia ...	Hind. Jak .. ... Tam. Pela. Tel. Panasa. Can. Halasu.	The sawdust gives a fairly good yellow dye in strong infusion. Is mordanted with alum, Symplocos racemosa, or milk hedge.

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Some Dye Plants and Vegetable Drugs—continued.

No.	English name.	Botanical name.	Vernacular name.	Dye Properties.
15	Blackwood, or Indian rose wood.	Dalbergia latifolia ...	Hind. Kala sisham ... Tam. Iti. Tel. Irugudu. Can. Bitti.	The sawdust gives a good brown dye. Treatment as for jack tree sawdust.
16	Padauk	Pterocarpus indicus ...	.....	Sawdust, with alum, Symplocos racemosa, and milk hedge ashes, give a fast dull yellow to reddish brown dye.
17	Milk hedge	Euphorbia Tirucalli ...	Tam. Tirukukalli ... Tel. Bontakalli. Can. Do.	Ashes are frequently used as a mild mordant. Chay root was always mordanted with it.
18	.....	Ventilago Madraspatana.	Tam. Puplay Chukkay ... Tel. Suratichekka. Can. Paplichekke.	Root bark, with chay root, gives fine purple-brown and chocolate dyes. With myrobolam is said to give a good non-iron black. Except for black, dye paler than is needed. The mordanting with alum and myrabolam always darkens the colour.
19	Cassia	Cassia integrifolia, or Tora.	Tam. Usiththagarai ...	Gives a weak but fairly fast yellow, boiled with alum, or alum and Symplocos racemosa. Several dippings and dryings are needed.
20	*Lac, lac dye, butti lac.	Coccus lacca	Hind. Lac, Lakh ... Tam. Kombu arakku. Tel. Lukka. Can. Aragu.	A minute insect which lives on the twigs of trees. Especially on Ficus religiosa *(pipal)* and Zizyphus Jujuba (ber). Once established on a tree, the smaller branches and twigs soon became covered with them. These are cut off and exposed to the sun to kill and dry the insects. The colour is produced and precipitated by washing. It is then evaporated, and, after the shellac of commerce has been removed the colour is laid on cloths, and dried in shade. When partly dry it is cut into squares and becomes "Butti lac." Gives a most valuable crimson and many other colours. With tin rivals the scarlet of cochineal.
21	Cochineal	Coccus cacti	Hind. Kirminj ... ... Tam. Tel. } Kirimanji. Can.	Is the female of the insect found on certain kinds of cactus in Mexico and Guatemala. Gives a magnificent crimson colour and a fine scarlet. Believed by South Indian dyers to be a seed or grain. Attempts have been made to acclimatize it in Southern India without success. The colouring matter is carmionic acid. Often used for silk carpets, rarely for woollen ones, owing to its cost.
22	Chay root	Oldenlandia umbellata ...	Hind. Chirval ... ... Tam. Sayaver. Tel. Chiriveru.	This is a common weed growing in sandy soil, and the uncultivated plant is said to be the best. Holder, in his 'Dyes and Dyeing in Madras,' says "The root is dried and powdered, resembling snuff. Mixed with water it gives a golden yellow colour. The addition of a little lime on milk-hedge ash turns this into a fine clear red. I am told that, before the introduction of aniline colours on the East Coast, chay root was extensively used for cotton-dyeing, and gave several very beautiful reds." Slater 'Manual of Colours and Dye-wares' says:—"Sooramjee.—A plant growing in India known to botanists under the name *of Morinda citrifolia*. In its native country, it has long been employed as a dye-ware yielding colours analogous to madder." And again, "Chayavra, a plant of the madder family capable of dyeing similar colours." Chay root is still used by cotton dyers, where they want a permanent crimson, rose red or pink colour. Gives good reds, which are rather dull unless mordanted with tin. Was used for reds in wool dyeing, its re-introduction should be encouraged.

* The best Butti Lac is procurable from Messrs. Jardine Skinner & Co., Kilburn & Co., and Carapiet & Co., of Mirzapur, U.P., and from Messrs. Angelo Brothers of Calcutta. Price varies with the market from Rs. 4 to 10 per India maund of 82⅔ lb.

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Some Dye Plants and Vegetable Drugs—concluded.

No.	English name.	Botanical name	Vernacular name.	Remarks.
23	Kamela powder ...	Mallotus philippinensis..	Hind. Kamela ... ... Tam. Kapila podi. Tel. Kapila. Can. Kurku.	A large tree. The powder falls off the capsules, and is collected on lime strewn under the trees. The colour is got from a glandular pubescence from the exterior of the fruit; a reddish powder. This is mixed with oil into a paste, and is then dissolved by water containing lime and a vegetable alkali. The colour ranges from gold to orange. It has rarely been used for wool dyeing.
24	Mango	Mangifera indica ...	Hind. Am ... ... Tam. Mam-marum. Tel. Mamidi. Can. Amba. or Mavina mara.	The fresh and dried unripe fruit are often used as acid mordants in dyeing processes. Is also a colour intensifier. Bark and leaves yield a yellow dye.
25	Tamarind	Tamarindicus Indica ...	Hind. Imli, imbli ... Tam. Puliyan. Tel. Chintha. Can. Hunise.	Fresh and dried fruit used as a vegetable acid and as acid mordant in dyeing.
26	Lime or lemon ...	Citrus acidtia and Citrus medica.	Hind. Limbú, nímbu ... Tam. Elemichumpullum. Tel. Nimmapandu. Can. Nimbe-hannu.	The fruit is frequently used as a vegetable acid, as a colour intensifier and as a mordant.
27	Red sanders wood ...	Pterocarpus santalinus ...	Hind. Sandal surkh, lal chunden. Tam. Shen-chandanum. Tel. Erragandhapu-chekka. Can. Kempugandha-cheke.	Chips of the wood boiled with wool or cotton give an excellent red dye. Is often used with other fast red dye drugs as a first or second dyeing. Also as a base dye for orange, etc. Mordants with vegetable alkalis. Brightens with vegetable acids.
28	Indian Gamboge ...	Garcinia Morella ...	Hind. Gótághanbd ... Tam. Iréval-chinip-pál. Tel. Rival-chini-pal. Can. Lamál.	Tree exudes a bright yellow liquid, which dried in shade is the gum gamboge of commerce, said to give a fairly fast yellow dye if mordanted with alum and milk-hedge ash.
29	.....	Calysaccion longifolium...	Hind. Surunj. ...	A large tree, bark and root give up a good red dye, said to be best mordanted with myrabolam and alum in separate baths, Grislea tomentosa flowers are often used with this dye. Gives a full rich crimson, quite fast. Is much used in Central India and Bombay for silk dyeing.
30	Henna	Lawsonia inermis ...	Hind. Mehndi ... Tam. Marudani. Tel. Gorantá-chettu.	Leaves give a reddish brown and a dull red dye. Mordants are catechu with pomegranate rind or alum.
31	.....	Grislea tomentosa ...	Hind. dha-ke-phul ...	Flowers astringent, contain a good deal of tannin. Said to give a good and fast red colour.
32	Casuarina	Casuarina equisetifolia and Casuarina muricata.	Hind. Sarrosh-phar ... Tam. Chouk maram. Tel. Sarva-chettu.	Bark is astringent and resinous. Gives light reddish-drab, which is good, but somewhat lacking in depth. Sometimes used as a mordant.
33	Tamarisk	Tamarix gallica and Tamarix indica.	Hind. Main	Grows in sandy beds of rivers and on the coast. The irregular tuberculate galls, which occur on the branchlets are a good mordant.
34	Soap-nut	Sapindus trifoliatus ...	Hind. Ritha ... ... Tam. Ponnang Kottai Tel. Kumkudu chettu or Kugiti Kaya. Can. Kudale-kayé. Urvanjik-kaya.	Fruit is an excellent detergent. Frequently used for finally washing wool before dyeing it in soft and delicate shades, often gives the wool a silky gloss.
35	Soap-pods	Acacia Concinna ...	Tam. Siyakkai ... ... Tel. Sikaya. Can. Sigekayi.	Pods are a very good detergent, often used for final cleansing of wool.
36	.....	Avicenna tomentos ...	.....	Ashes are used as a mordant, and also as a detergent.
37	Bulb-bearing yam ...	Dioscorea bulbifera ...	Hind. Tamin Kand ... Tam. Vettilaivallikkizhangu. Tel. Chedupaddu dumpa.	A very good detergent for wool, has much of the effect of soap nut. Should be more used.
38	.....	Nyctanthes Arbor-tristis.	Hind. Harsinghar ... Tam. Parijatapu. Tel. Paghada. Can. Hansing.	Flower tubes often used with flowers of Cedrela toona, turmeric, or indigo. Mordanted with alum, or lime juice.

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Some Mineral Dye Drugs.

No.	English name.	Scientific name.	Vernacular name.	Remarks.
1	Sulphate of iron ..	$FeSo_4$	Hind. Heera Kasis ... Tam. Anna bedi. Tel. Do. Can. Do.	Used with other dye stuffs it gives black, dark grey, and occasionally violet. A mordant.
2	Crude carbonate or sulphate of soda.	$NaCo_3$	Hind. Reh ... ... Tam. Aplakharum. Tel. Do. Can. Aplakara.	The efflorescent salt found on sour land (usar), used for washing wool, and to dissolve a colour by alkaline action.
3	Sajji. Mixed impure carbonate of soda and potash.	$NaCO_3$, with some earth, and a little K_2Co_3 as impurities.	Hind. Sajji ... ... Tam. Mara uppu or sambal uppu. Tel. Buddi uppu. Can. Mara uppu.	Produced by the burning of strongly alkaline plants, adding them to a strong solution of reh, and drying the mixture by exposure to the sun. Used in dyeing and wool and cotton scouring and bleaching.
4	Lime	Ko	Hind. Chunam ... Tam. Sunnambu. Tel. Sunnam. Can. Sunna.	Used in dyeing and bleaching, also in scouring wool, especially that from dead sheep; hence called "chunam" wool.
5	Alum. Sulphate of potassium and aluminium.	.....	Hind. Phitikari ... Tam. Padikharam. Tel. Do. Can. Patikara.	Largely used in dyeing. The most valuable of all mordants. For many dye processes it is well to give the wool a steep in a weak hot alum solution, and dry in the sun before entering to the colour bath.
6	Blue vitriol	Sulphate of copper ...	Hind. Tutya ... .. Tam. Thuththam thurisi. Tel. Mailthuththi. Can. Mailthuththo.	Gives with lime a light blue colour.
7	Sulphuric acid ...	H_2SO_4.	Hind. Tezab ... ... Tam. Gandagadravakam. Tel. Do. Can. Do.	Largely used in dyeing. Sulphindolic acid is made by dissolving powdered indigo in it, in the proportion of 3 to 1 of indigo.
8	Tin, Tin spirit, or Dyer's spirit.	Stannum	.....	All the tin mordants are of great value in the dyeing of scarlets, crimsons and other lake (lac) colours generally. A form of tin spirit in common use is thus made. Aquafortis duplex 8 parts, salammoniac 1 part, dissolve. Now add very gradually grain tin 1 part; when dissolved close the jar so as to seal the solution from the air. Sometimes equal parts of aquafortis and muriatic acid are used in the above formula, giving "Plum spirit" or "Red spirit."
9	Nitromuriate of tin ...	.....	.....	
10	Protochloride of tin ...	.....	... ..	
11	Muriate of tin ...	.....	.....	
12	Sulphur	S	.....	With carbonate of soda, a little turmeric, and potash, flowers of sulphur give an excellent and fast yellow dye. Used also for wool bleaching.

LOOMS, WARPING, WEAVING, ETC.

There does not appear to be any necessity for going deeply into the fullest details connected with the looms, warping and weaving, etc., the processes are of the simplest, yet nothing but experience can practise them properly. I content myself therefore with the following brief note and diagram.

The loom is most simply and cheaply made from two heavy upright wooden, stone or masonry posts, pillars, or pairs of rails, with a pair of holes or sockets in each, in which

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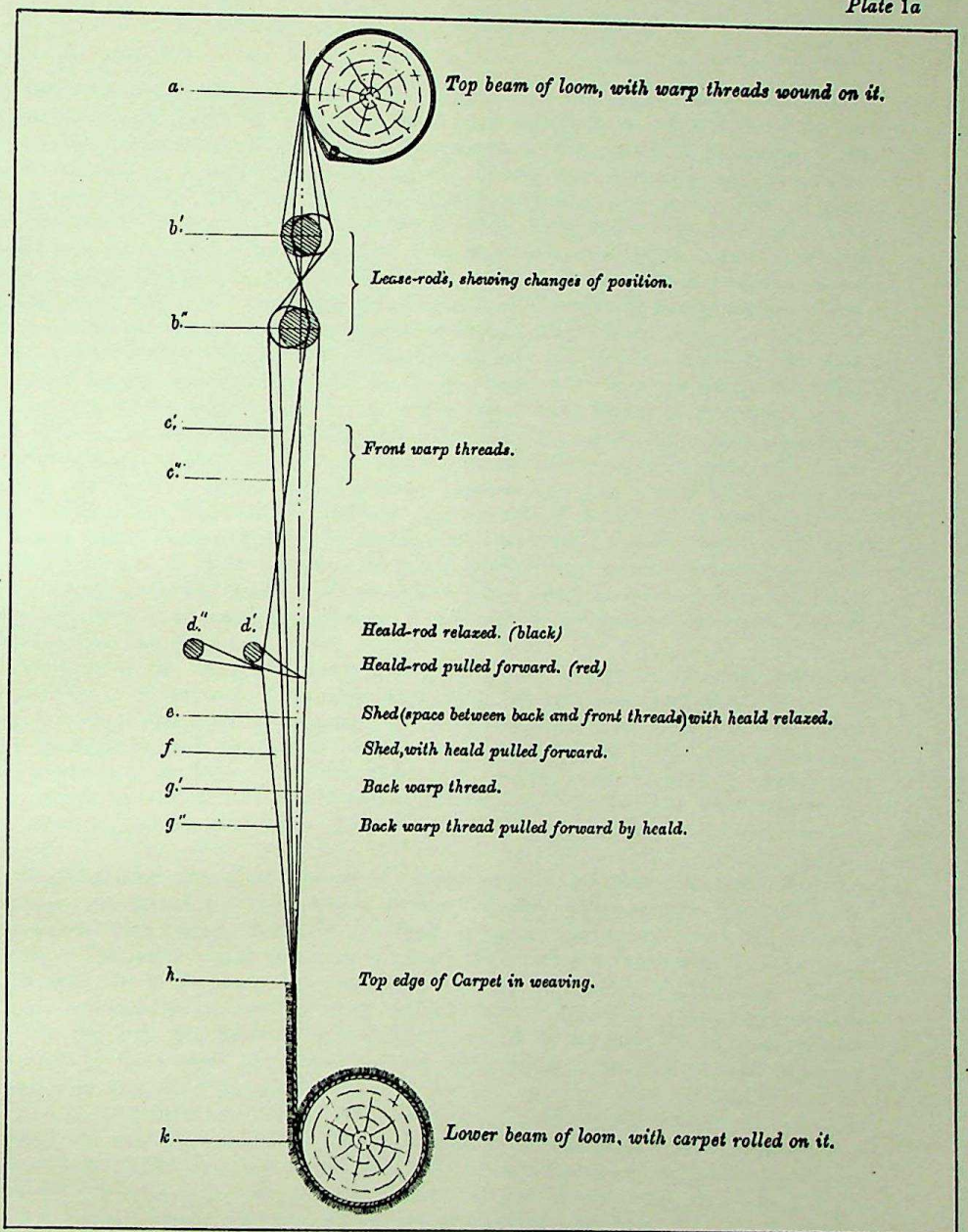

SECTIONAL ELEVATION OF A CARPET LOOM, ILLUSTRATING THE MOVEMENT OF LEASE-RODS AND HEALDS.

Adapted from 'Monograph on the Woollen Fabrics of the Bombay Presidency'—1899 B. A. Brendon, I. C. S.

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the two loom beams, which they carry, can revolve. The warp [Tam. *pavu*, Tel. *padugu*] of cotton [usually "spun up" mill yarn from 5*s* to 20*s*] plain or coloured, hemp or jute twine [of a thickness which is usually proportionate to the quality of the carpet to be woven] is made in a most simple way, without anything like a warping apparatus. Two long iron or wooden stakes are firmly driven into the ground at a proper distance apart, and the weaver walks round and round these, laying the thread evenly over each as he passes, and maintaining a regular tension. The warp is crossed in the centre, so that it forms a figure of eight on the stakes. While the warp is being "laid" on the stakes, another worker "laces in" a cord through it, and on the outer side of each of the two stakes, and sees that each wind is of equal length, otherwise equal tension cannot be got. The warp is now carefully slipped off the stakes on to two iron rods or bamboos, and these are either hooked into hooks in slots, cut in the lower roller beam, or lashed into them. The top end of the warp is then set on to the upper roller beam. If the warp is even, there will be no slack threads found when the warp is tautened by turning the rollers. One often sees the yarn tautened in places by slips of wood or wedges, but, if the warping and healding are done properly, this is unnecessary. The yarn is rolled on to the upper beam until it has stretched, and it is kept on tension for a day to allow of further stretching before weaving begins. In North India the warp is usually stretched on pairs of stout iron rods or pipes—wherever the width of the carpet admits of their use—equal tension being given by chains on double ended screw couplers. The old-fashioned metre gauge railway wagon couplings are much in evidence in the factories of Amritsar, where they are also used for loom tension.

Winding of the carpet as weaving progresses, and tension to the warp, are thus provided for. At one end of the loom each beam has two, sometimes four, holes in it, stout iron or wooden bars are inserted into these, one into each loom beam or roller. After getting the warp as taut as possible by hand, a chain is hooked on to the bars, and tension is given by a double shackled screw coupling [*pench*] which is hooked into a convenient place toward the lower end of the chain. The chain and screw coupler are very often replaced by stout ropes, the twisting of which gives and maintains the necessary tension.

The mechanical part of the weaving of a carpet may be thus described. After the warp has been mounted on the loom beams, the two "healds" [Tam. *vilathu*, Tel. *vadi*] are attached. It often happens that only one heald is used; the second is not an absolute necessity. The bazaar carpet weaver almost always does without it, and works with the heald on the back row of the warp. An advantage of the second heald is the increased "shed", or space between the two rows of warp, which it gives. The heald rods [Tam. *vizhuthu kol*, Tel. *atsu kol*], are laced by loops [healds], one set to the back row of warp threads, the other to the forward one. Both rods are so connected that the forward movement of one relaxes the other, and *vice versa*.

One of the "lease rods" [Tam. *alagu*, Tel. *laika*] is now passed between the two lines of warp, and near the upper loom beam. The healds having been reversed, thus crossing the warp, the second lease rod is put into position below the upper one, and is kept from falling by a pair of loops, one at each end of the pair of rods. In many cases single and not double "leasing" is made, by the use of one lease rod only.

The purpose of the lease rods is to keep up equal tension on the front and back row of warp when the heald is being reversed, and after each row of weaving is completed.

We have seen that the forward movement of the back warp threads, acted on by the heald, causes the lease rods to travel in opposite directions, straightening and shortening the warps between the under or [only], lease rod, and the point whence they leave the lower

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loom beam, therefore lengthening them between the working edge of the carpet and the lease rod. The heald, being reversed, now drags them into position. The tension on the front threads is also increased by the forward movement of the heald, so that a quite even warp tension is thus ingeniously secured.

The shed [Hind. *chhed*, Tam. *puni*, Tel. *ani*] is the space which a free heald gives between the front and back rows of warps. It is through this space that the woof yarns are passed.

The weavers sit in front of the loom, each one being usually responsible for from 18 to 30 inches of width of carpet. Each weaver has balls of yarn, of the colours to be used in the carpet, hanging above him, within easy reach. One of the weavers, or, in the case of a large carpet, a "reader" sitting at the back, calls off the stitches, or reads the pattern from a section paper, drawing, diagram, or a sample carpet.

Fifteen or twenty rows of weft are first woven on plain, without pile, and well beaten down. This is done to ensure the end of the carpet holding well together, and that the warp threads may keep their relative distances. The finishing off of a carpet on the loom is done in the same way.

The woollen yarn is held in the left hand, and a curved knife in the right. The warp is then taken hold of, the yarn twisted round it, and crossed on itself, and the knot so made is cut off with the curved knife, when a row of knots across the whole width of the carpet has been completed. The weft threads (cotton, hemp, or jute) are then passed between the two rows of yarn, and beaten down with a bent iron-toothed comb, in shape somewhat like a carpenter's adze. The heald rod [Tam. *vizhuthu kol*, Tel. *atsu kol*] is then reversed, the warp thus locking in the row of knots of pile. The row of pile is then clipped with a pair of villainous looking country-made scissors, and so the process goes on to the end. Boys can weave quicker than men, especially where small fingers are needed to pass between the warps of fine count carpets. The length to which the pile is cut depends on the will of the weaver, and the class of carpet to be made.

Expert weavers rarely weave in, at once, a whole row of stitches across the loom, and this especially when, in, as is often the case, a design with small and frequent repeats, or which they are often making, or when they have learnt the pattern by heart. They work in all the stitches of one colour in the row, go on to the next, and so on, until they have put in all the colour except the ground, which is worked in last.

In carelessly woven carpets one often sees the warp strands shewing at the back as white spots between the rows of pile knots, these are known as "suet" or "fat spots" [*cherbi*]. A well woven carpet has the weft [*bana* or *buktas*] always running through it in sets of two stout lines; one passed in from each side, so that a pair of them is locked in above and below each row of knots.

Badly made carpets have often three, four or more lines of woof to every line of pile knots [*pech* or *ganl*]. This is altogether unnecessary, and it separates the lines of pile, but it gives cheap bulk and weight to the carpet, cotton or hemp being much less costly than dyed woollen yarn. The woof is generally dyed deep blue.

Some other faults in weaving are, knotting the stitches on to two strands of the warp instead of to one [*jhuta bunai*]: in cheap coarse carpets this is oftener the rule than the exception, and in many good grade carpets main and border ground filling, and other large masses of one colour, are worked in this improper way. The weft is sometimes passed from one side only. And occasionally two or three rows of pile are worked in with only a line of weft above and below them.

One often finds carpets which do not lie flat; this is due to the woof threads having been drawn too tight. Irregular beating with the comb is another bad fault, it is easily

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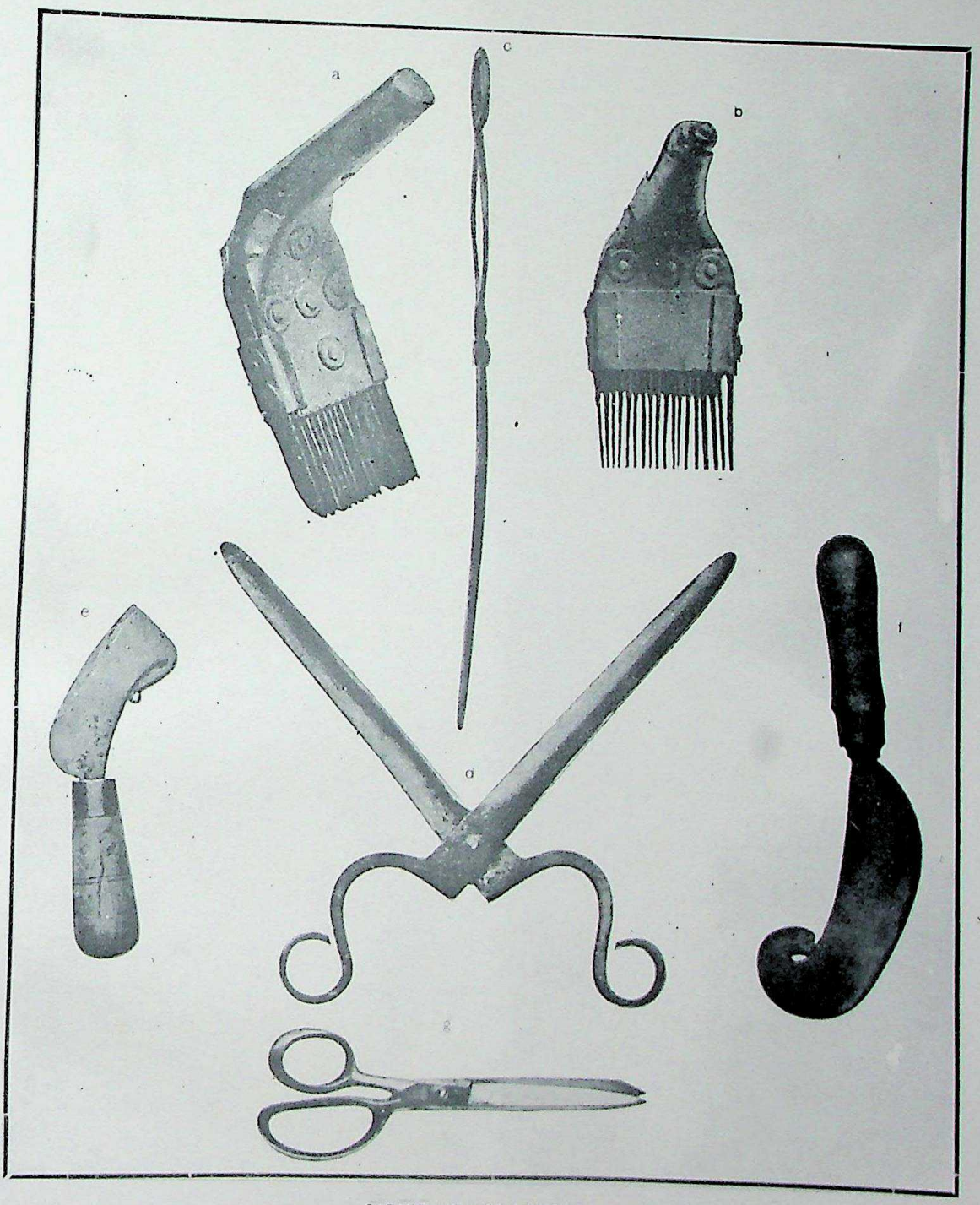

CARPET WEAVER'S TOOLS.

a. b.—The *Kanga (shyana)* or comb, used for beating down the wool and pile knots. Fineness of the teeth varies with the count of carpet to be woven.

c.d.—The *Muga: (kanchi)*, or scissors, for shearing evenly the pile ends which form the "velvet".

e. f.—The *Kaste (chhuri)*, used for cutting off the yarn after the knot of woollen yarn has been tied.

g.—A form of scissors often used in Ireland for hand loom carpet work.

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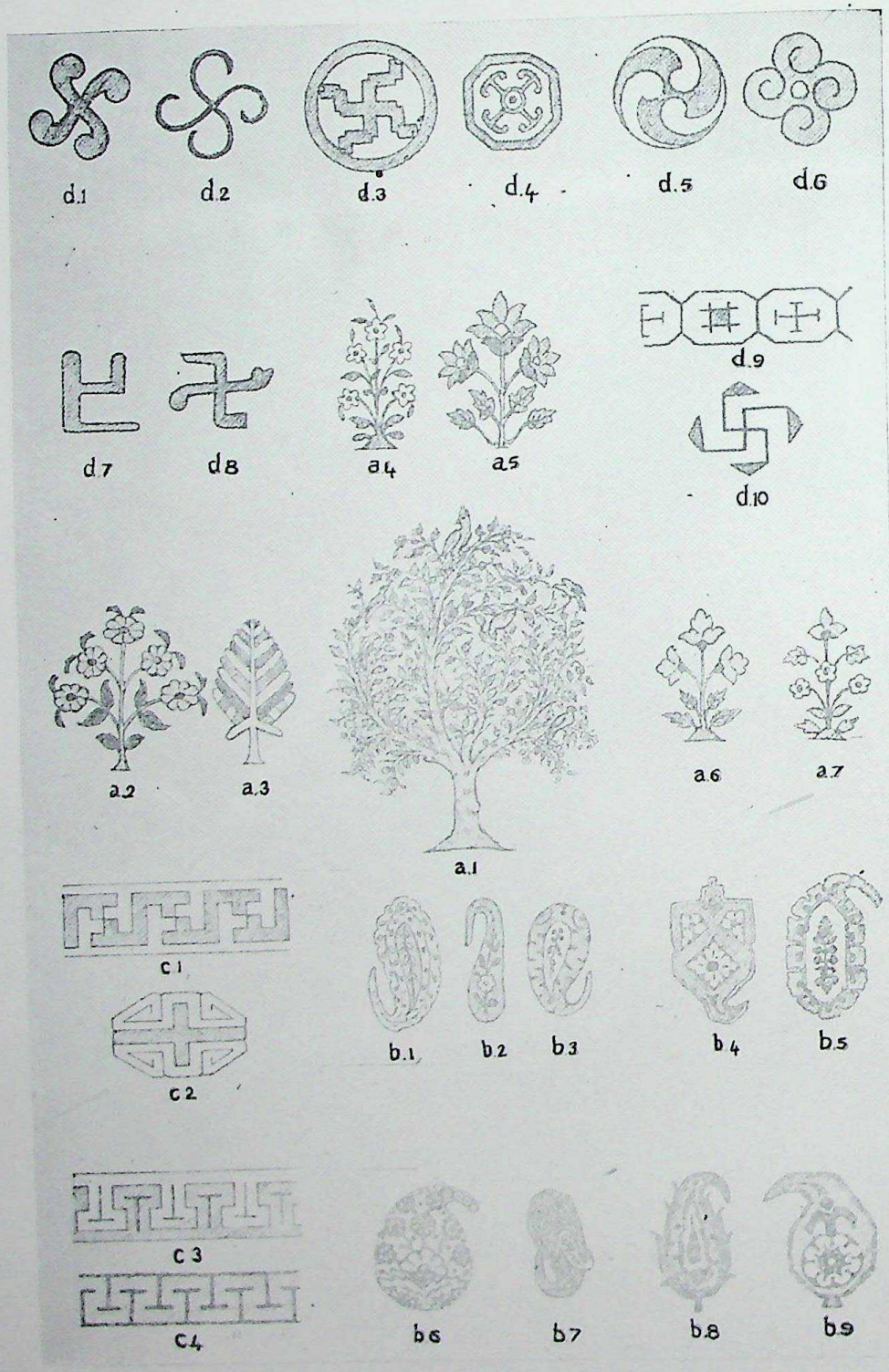

a.—TREES OF LIFE.—1. From an old Khorasani Carpet. 2, 3, 4, 5, 6, 7, forms found primarily in Tabriz and Feraghan rugs, also in South Indian Carpets; 8, a Moghlai form, from an old Ellore Rug.

b.—FORMS OF the cone of flame, mango, pear, palm fruit, serpaitch or river-loop device.

c.—SOME FRETS.—From Indian carpet borders, illustrating the connection between the 'tau' and Greek and Chinese keyed patterns.

d.—SVASTIKAS, FYLFOTS GAMMADIONS., ETC.,—1, 3, 5, Chinese forms; 2, 4, 6, Persian forms; 8, 9, 10, Hindu forms. These are all taken from Indian-made carpets.

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traceable by the backing looking uneven. Carpets that have been slackly and unevenly beaten soon shed their pile.

The looms are usually built in long pits about eighteen inches deep, sometimes of masonry, but often only excavated, and the earth at the sides, top, and bottom, kept firm and clean by constant cow-dung plastering. The weavers sit on the edge of this pit, which catches all wool cuttings, etc., and the under loom beam, or roller carrying the finished work, is consequently almost at ground level. An objection to this is that rainy weather often appears to communicate damp to the carpets, which certainly does not improve them. The frequent Persian practice of having the lower roller well above floor level, and seating the workmen on broad benches, is probably the best.

The very simple tools of the weaver are illustrated in plate No. I, facing the title page, and need no comment. They are of the crudest description, forged by village smiths. Weavers will rarely use English scissors, their good old conservative objection being—"We know our 'desi' scissors, others are strange to us."

The different forms of "knots" in use in carpet-weaving may be seen at a glance on plate No. II and require no explanation.

The fineness of a carpet can always be tested by turning it on its face, and counting on the back the number of stitches in a square or linear inch, or by counting the pairs of warp strands on the fringe at the end. The qualities usually made are, 4 stitches each way = 16 to the square inch, 4 stitches in length by 5 in breadth = 20 stitches to the square inch, 6 in length and 6 in breadth = 36. Up to this count carpets may be called coarse. 7 by 7 = 49, 7 by 8 = 56, and 8 by 8 equalling 64 stitches, comprise medium grade carpets. The 8 by 8 count being, if properly made, a really sound, handsome and useful carpet, it ought to show little or none of the warp or weft at the back, which should look almost as clean as the face of good Berlin wool work. Few carpets finer than 8 by 8 stitch appear to be made in this Presidency, except in the Central Jails, the Madras Anjuman Workshops, and the School of Arts, Madras. High grade carpets comprise 9 by 9 stitch, occasionally 9 by 10, 10 by 10, 12 by 12, and up to 16 by 16, or 256 stitches to the square inch. Wool spun suitably for carpets finer than this is not easily procurable in South India, and it is also necessary for the weaving of these fine "counts," that the wool be soft and fine.

It is unfortunate that so many carpets made in South India are woven of "chunam", "limed" or dead wool, *i.e.*, wool taken from dead sheep, or obtained from butchers' fleeces. Almost all the cheap export rugs made in the Madras Presidency are made from this wool. It is harsh, brittle, and rarely takes up colour properly. It is also used mixed with "live" wool. A great objection to the use of chunam wool is that in damp weather it gives off a distinctly offensive smell, and this for years after the carpet has been made.

Of weaving, J. K. Mumford, in his 'Oriental Rugs,' says that it is "the patient, painstaking labour at which so many hundreds of thousands of swarthy fingers are flying, and have been flying ever since the days of the Pharaohs. Measured by results it is a wonder work; watched, in its tireless repetition of three simple processes that a child can master, it seems no more of an art than the constant turning of an hour-glass—which, in fact, to myriads of these Eastern people, it is. The whole thing is simple, to look at, to read about; but there is nevertheless, some peculiar spirit, some mental drift, some inherent and mysterious fitness pervading, and governing their work, which makes these Orientals the best weavers in the world. Peoples of other races have reared looms, and dyed yarn, and, borrowing the tricks of colour and of stitch from Turkey and Persia, have striven to work out upon the warp a harmony as rich and full as theirs. But they have failed.

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"For it is not to be disputed that there is some faculty which to this day enables the Orient to excel the West in hand-wrought fabrics, even with uncouth appliances such as that same West has long ago outgrown.

"Any lad with a knack for carpentry can make such a loom as that upon which the Eastern does his weaving. Plain, absurdly primitive, it endures for a lifetime, or many lifetimes, and its timbers are often adorned with carvings done by hands long since still. It is in essential principles the same old-fashioned structure that is pictured on archaic tiles and vases; the same that we know to have been used for thousands of years in the weaving of coarse cloth and canvas. The method, too, is the same in its rudiments, with the addition that instead of throwing the weft across the warp compactly, to make a thin, firm web, the knot upon the warp is employed to form a surface, and the weft becomes merely a binder, holding each row of knots close-pressed to its neighbour. The addition of the pile to the primitive web is believed to have originated with some of the tribes of Central Asia, where severity of weather made warmth a desideratum."

Vambéry tells how the nomad and pastoral races in Asia Minor, Anatolia and Persia still invent for themselves their own modifications of the old patterns, entirely by rule of thumb. The head woman, he says, traces a pattern on the earth, and thus the work of the making of a carpet goes on amongst these peoples, just as it did in old time.

In all the East the carpet industry is almost entirely confined to Muhammadans, but there are still many Christian weavers in Turkey and Persia, mostly Armenians, Copts and heterodox Greeks. They usually work for Christian masters.

It appears to me likely, that the earliest form of weaving was the interlacing of withes, pliant branches, or stout creepers, around poles, other withes, or staves, to form a wattled fence, a mat, or the walls of a wattle and daub house. From wattle work to the weaving of mats out of rushes, or sedge, or of fibre was a quite easy form of transition. Then came the need for some form of clothing, as a protection from the weather, and from venomous insects and reptiles. Following this, the possibility of using the wool or hair of sheep and goats, or wild animals, must have occurred to the minds of the primitive weavers, and thus the production of textiles proper become a regular step in the natural development of mankind.

The manual dexterity of the weaver led him in time to seek to decorate his work by introducing some simple patterning into it. He would come to find that certain plants would stain the cloth in attractive colours, and in due course he would get to know how to apply these and make them more or less permanent.

The need for something warmer, doubtless led the weaver to sew tufts of wool or hair on to the cloths he wove, and bye and bye he would have learned to in-weave these, and thus form a pile.

NOTE ON THE SYMBOLISM OF THE ORIENTAL CARPET.

"In a symbol there is concealment and yet revelation, silence and speech acting together, some embodiment and revelation of the infinite, made to blend itself with the finite, to stand visible and, as it were, attainable there."—*Thomas Carlyle.*

Sir George Birdwood says—"A deep and complicate symbolism, originating in Babylonia and possibly India, pervades every denomination of oriental carpet. Thus the carpet itself prefigures space and eternity, and the general pattern or filling, as it is technically termed, the fleeting, finite universe of animated beauty. Every colour used has its significance, and the design, whether mythological or natural, human, bestial or floral, has its

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hidden meaning. Even the representatives of men hunting wild beasts have their special indications. So have the natural flowers of Persia their symbolism, wherever they are introduced, generally following that of their colours. The very irregularities either in drawing or colouring, to be observed in almost every Oriental carpet, and invariably in Turkoman carpets, are seldom accidental, the usual deliberate intention being to avert the evil eye and insure good luck."

The cause and origin of most of the decoration in Eastern carpets is still largely matter for conjecture. Much of it is hidden away in the gloom of the past. Much has been so overloaded with tradition and folk story as to make it difficult to find out what these forms really meant. All Oriental and specially Persian art (from whence the Indian carpet as it is known to-day undoubtedly came) has taken, converted and crystallized flower, tree, branch, and creeper forms into its own conventionalized realism. Some countries have gone still further, and these conventional forms have become modified into geometrical ones. Owen Jones suggests that Buddhist art and also contemporary Hindu art, date from a time when Greek influence, dominating the Punjàb and Indus and Gangetic countries, and the lands below the Himalayas, spread to Southern India, and that these were preceded by Persian and Assyrian art; and, that, at a later date, Hindu art became saturated with the Muhammadan lotus forms through the Muhammadan conquerors of the seventh century. With all of this opinion we cannot agree, the lotus was from the earliest times a sacred flower, both to Buddhists and to Hindus; it certainly was so long before the dawn of Islam.

We sometimes find the lotus in some old Persian rugs, and often in more modern ones. The "palmette," palm of the hand, pink in profile, or "rosette" probably came from Babylonia through Egypt; the bud, which often, with the foregoing, forms the "knop" and "flower" design (symbolical of bounty and power) is an undoubted lotus form. The "bent lotus bud," "mango," "pear," "pine cone," "serpaitch," or "sacred flame" device, which one so constantly sees in one form or other in Eastern carpets, appears first in Babylonian sculpture. Of all these J. K. Mumford says:—"It is significant that the forms which show indubitable kinship with the lotus are chiefly used in border designs, thus binding and unifying the life story told in the body of the carpet with an unbroken succession of the emblems of eternity and renewed being, the bud signifying birth, the full-blown flower the completeness of age; and the creeper typifying the long repetition of the life process which separates and yet unites the two."

The Tree of Life is another old carpet symbol, illustrating the old tradition running right through Asia and Europe, of a sacred tree shading the faithful in Paradise, and common to all faiths in some form or another. Christianity had it in the "Arbor Perindex,"* "Arbor Vitæ," or tree of faith. It was said to grow in India, a type of the Church, the happy doves in its branches being the faithful, and the serpent trying to entice them away from their healthful rest being "that antient worm the Devil." Often immortal birds rested on it, and flowers of many hues covered it to the almost entire exclusion of leaf. Its antithesis was the Judas tree, traitor's tree, or Arbe de Judée. Sometimes one sees the entire tree in such a form as to be beyond all recognition, but for smaller representations of it within, or amongst the branches of the larger. Central Asian carpets show it stark and stiff as if cut out of metal. One occasionally finds it in form like the seven branched candlesticks of the Hebrew temple, or shaped like the many [usually twelve] branched lamps of Hindu worship. But in Persian art, and in Indian art from the Persian, the tree of life becomes a beautiful flowering plant, with or without a vase, or flower pot or a sprig or spray of simple flowers. Some forms of it suggest the stiff notched and

* I have not been able to get any explanation of this name, which two writers give. Possibly it is a mistake for "*Arbor perfugium*," which was certainly one of the many names of the tree of life.

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curled wooden tree out of a child's Noah's ark. Others bear huge leaves. This form doubtless represents the Moslem "*Sidrat-ul-mantaha*", "*tauba*", tree of the heavenly mansion of the Archangel Gabriel, or tree of Paradise, with its leaves "like the ears of an elephant, a leaf for every human birth." It sometimes appears in carpets as a cypress, "*Shajarat Allah*" or "*Shajarat-al-djinn*. And sometimes its form suggests the weeping willow, or a flowering or date laden palm. Hinduism has its sacred trees. Sivites have the *Ficus indica*, Vishnuvites the *Ficus religiosa*, and worshippers of Brahma specially recognize the *Butea frondosa*. *Tulsi*, *Bil*, *Shami*, and *Darlu* are all sacred to one or other of the Dii Majores, as are many other trees. *Ficus religiosa* is the sacred *Bo* tree of the Buddhist faith. And the pomegranate is a sacred tree of life, type of beauty and fecundity.

In the Madras Museum is an old Coromandel hand-painted or printed cloth, decorated with a large tree. This is much in the style of the large trees of life found upon many old carpets. Birdwood in the 'Industrial Arts of India,' 1880—illustrates a very beautiful tree of life on a Masulipatam hand printed and painted chintz purdah. It has fine foliage as its back ground. The branches of the tree are curiously interlaced, birds rest on its branches. As supporters there are two peacocks on either side of the tree and facing it; each holds a snake in his bill. Below the tree are various fishes and turtles, swimming in a quaintly painted sea. I saw, some years ago, a strange old Persian silk rug with many of the characteristics of this cloth.

The "Svastica" probably takes its name from a Thibetan sect of Buddhist rationalists. It is often found in carpets in some one or other of its very many forms. It is often seen in Persian and Indian carpets, frequently in Central Asian ones, and almost every good old Chinese carpet has it somewhere or other in the patterning. It may be taken as symbolising the sun, flame, light, paternity, and also the motion of the earth, health, happiness, and fortune. It is the badge of the seventh "tirthankara" of the Jains, sign of the sun. It appears in most of the rock-sculpture foot prints of Buddha, and in the "wheel of the way" of the Buddhist ritual. Hinduism specially recognizes it as an emblem of Agni and of Indra. It occurs in Pompeii along with the phallus. It may be said of it that, no matter for what purpose it was used, it was always decorative, and, except in its reversed or left handed form, it was ever an auspicious sign.

One often finds, in old carpets, varying forms of the svastica, fylfot, svastic cross or gammadion, also known as the "crux ansata." It sometimes resembles two or more serpents intertwined, and it is, in this form, known as the sun-snakes or "surya-nâg." There is also the "ogee" form of svastica. In this the arms crossing each other at right angles curve off to the right and left, increasing in thickness to the middle of the curve, and finishing in a point. In its three-armed form it occurs on Assyrian coins and, as a minor mark, on those of Alexander, the Great, B.C., 300 to 320. Birdwood claims in the svastica the original of the Greek and Chinese key patterns. One often finds in Central Asian carpets a key border, in which the svastica is easily traced. The "latch hook" with its many variations is doubtless in itself a variant of the svastica.

Closely linked with the svastica is the Tau, T, sacred sign, or sign of life. It is often found in carpets. It appeared in the first "Labarum," or idolatrous standard of the pagans, bearing at once the crescent and the tau cross, the one as emblem of Astarte, queen of heaven, the other indicating Bacchus. In Egypt, it was a token of supreme power, and probably came to be worshipped as the symbol of light and generation, or perhaps feared as the image of death and decay. The scarab—sacred Egyptian beetle—bears, in the sutures on its back and across the thorax, the single T. In the centres of some rugs one often finds a 24 or 28 angled Chinese form of svastica, surrounded by T's or Taus. It

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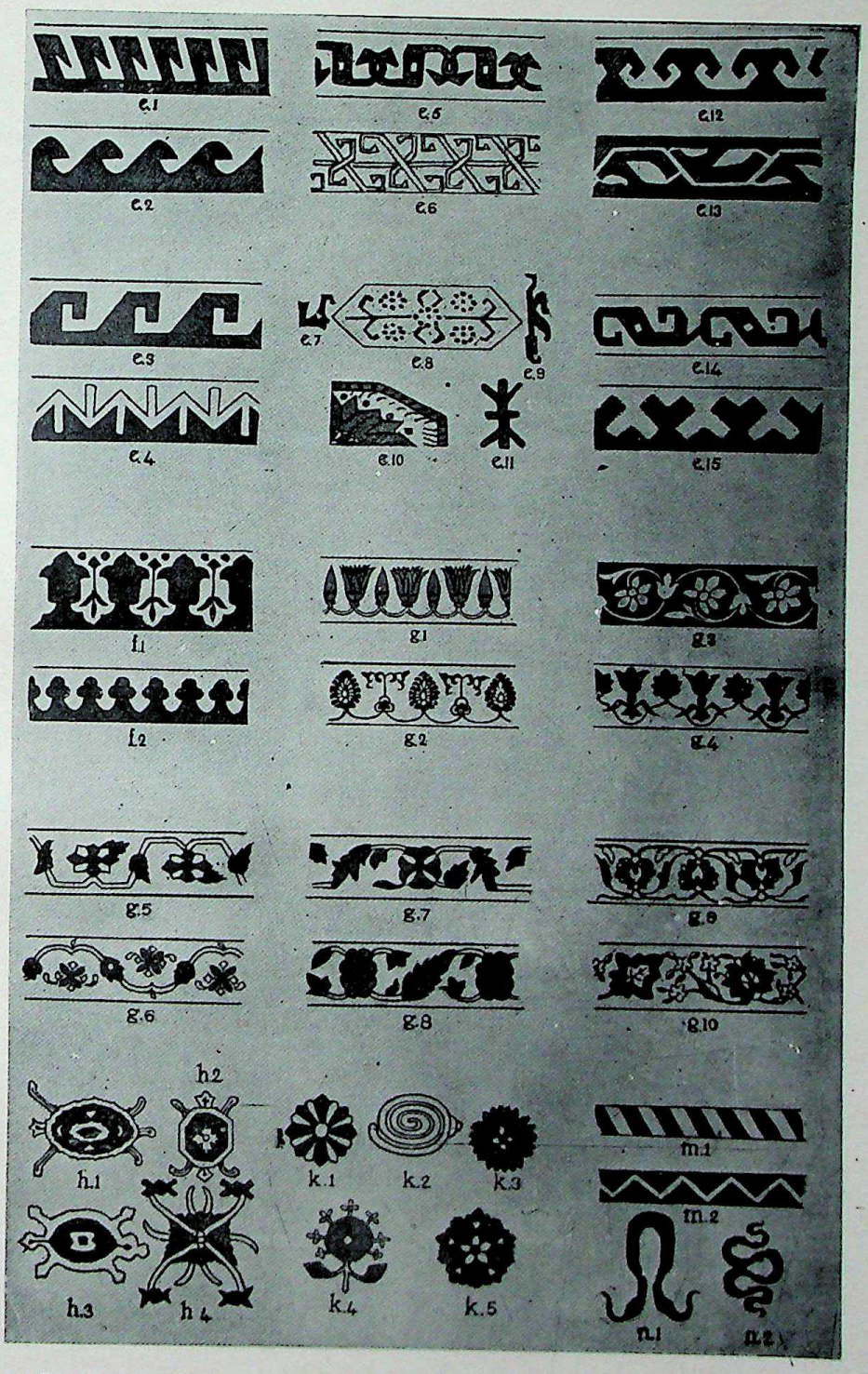

e.—LATCH HOOKS.—These probably first appeared in, and are still common to, carpets made by nomad races in Persia and Central Asia, and they appear in all Indian Carpet Districts; they are apparently divergences from the "fret" and "tau" forms.

f.—TREFOILS.—Frequently seen, usually as minor bordering, in Persian, Moghul, Deccan, and South Indian Carpets.

g.—KNOP AND FLOWER DEVICE.—1, From Nineveh; 2, old Persian; 3, suggests honey-suckle palmette scroll form; 4 to 10 various Indian and Persian forms.

h.—TURTLE AND CRAB FORMS.—Often found in borders of Indian Carpets.

k.—ROSETTES. 1, 3, 5, Common to Indian and Persian Carpets; 2, a whorl from a shell, on an old Ellore Carpet; 4, a Chinese form, often seen in Ellore Carpets.

m.—FORMS OF.—1, The "barber's pole" runner; 2, a "flowing water" runner or edging.

n.—CHINESE CLOUD-BANDS.—Common to China, Turkey, Persian and Indian Carpets.

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a

b.

a.—MADE AT THE VELLORE CENTRAL JAIL from, undoubtedly, in the first instance, a good specimen of sham orientalism.
b.—RUG MADE AT THE VELLORE CENTRAL JAIL. Probably a copy of an old Wallajahnagar rug.

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sometimes occurs as two Taus, or in a triple form. The Tau was also believed to be the "blood mark" on the door posts of the Jewish houses on the first Passover day, and it was to the Jews a symbol of health and safety, of happiness, and of the hope for, and belief in, a future life.

These svastic and tau forms occur all over the world. On the oldest buildings in Europe, on temples, palaces, rock-hewn sculptures in Asia, on the temples of the Incas, in Peru and Mexico, in south and equatorial Africa, everywhere, in short, one finds these familiar crossed, and curved forms, all of which are, in some way or other, connected with religion.

The very old pattern, often called 'the fish,' 'leaf and flower' or 'fish and flower,' and also known as "Feraghan Crescent," "Herati," or "Collector" in the North of India, is, in its varying forms, found wherever Oriental carpets are woven, and each district appears to have its own name for it. It is most common in the form of a rosette or open regular flower, with long curved and usually serrated leaves springing from each side of it. These occasionally are undoubtedly woven as fishes, the eye, mouth and tail being quite distinct, and enclosing a square or an incurving lozenge-shaped device. It generally covers the whole of the ground in a quite small repeating pattern. The fish bulked large in the worship of Isis, and has been long a royal emblem in Oriental countries. The rosette or flower certainly suggests the open lotus flower. If for the rosette and square incurving sides of the Herati pattern, we substitute yellow or white flowers with thin splayed out stalks, we get the "*Gul-i-henna*," or "flowers of henna" pattern.

The sunflower with its characteristic centre, bold big petals and stiff stalks, the vine with its fruit, tendrils and leaves, the ivy and many other flowers and leaves, are found in Oriental carpets. Each has its special symbolism and inner meaning.

The pear, lotus bud, serpaitch, pine cone, mango, *cucus*, *butha*, or cone of flame pattern, is another device which in some form or other appears in the designs of almost every province in which carpets are woven. One finds it as the main decoration of a border. It is often used to cover the whole field; sometime the necks of two or three are elongated, and twined one into the other, and an arrangement of them occasionally forms centre and corner-pieces.

It has been claimed for this form that it originated in Kashmir, illustrating a loop in the windings of the river Jhelum above Srinagar. Some have held it to be a palm fruit, —apparently a rather far-fetched theory. Mumford, quoting the late Shah Nasr-ed-Din's chief interpreter claims that "the device represents the chief ornament of the old Iranian crown, during one of the earliest dynasties; that the jewel was a composite one, of pear shape, and wrought of so many stones that, viewed from different sides, it displayed a great variety of colours." There is no doubt that this very old jewel is one of the most valued possessions of the Shâhs of Persia.

If this explanation be correct, it is easy to understand the depth of sentiment connected with it. It is not to be supposed that the shape was chosen for such perpetuity without some real symbolic or religious reason. Taking into consideration the deep devotion to fire and the sun of the ancient Persians, there is no room to believe otherwise than that this crown-jewel shape represents, in its first meaning, the flame which they worshipped, and which is reverently worshipped to this day by their posterity here in India and in Southern Persia. Here is what appears to me to be very strong support for Sir George Birdwood's contention that this device represents neither more nor less than the cone or flame of fire of the ancient Iranian fire worshippers.

The turtle, crab, and lobster (or cray-fish), frequently appear, especially in borders. They are said to symbolise immortality, possibly on account of the old belief that they lived for centuries. The Serpent indicates craft, subtlety, lust, or desire. The Crescent means

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strength and power. One often finds in patterning two or three crescents linked together by a flower or rosette; so arranged they are said to be emblematic of great or increasing strength.

Two triangles joined in the form of an hour glass are emblematical of fire and water. The six-pointed double triangle (seal of Solomon) denotes Divine wisdom. This emblem, if bearing a T or triple tau in its centre, is believed to have been a symbol of recognition of the Divine Omniscience, Omnipotence and Omnipresence. A star with an uneven number of points, usually the pantagon, or blazing star, but occasionally seven-pointed, is a symbol representing "The Great Light," or "Glory of God."

The "Chinese cloud-band," which one often finds in good old-fashioned Indian carpets in old Persian patterns, is a type of the heavenly rest, doubtless originally the *Nirvana* of Buddha. Careless patterning often converts the "cloud-band" into a serpent and *vice versa*. Zigzags or waved lines sometimes denote water, or if sharply angular, lightning. One occasionally finds forms which appear to be combinations, or crosses between the winged globe and the thunder-bolt. The resemblance to both these forms is remote, but little more so than those illustrated in D'Alviella's 'Migration of Symbols.' The winged globe originated in Egypt, and travelled naturally into Persia, and thence to India.

The lamp frequently found hanging from the arch in prayer rugs, and occasionally at each end of the central medallion of a larger carpet, is of course a representation of the lamp of Islam, lamp of faith, or lamp of life. This lamp is most beautifully illustrated in the famous Ardebil carpet, which is in the South Kensington Museum, London.

One often finds a small running border somewhat simulating a bamboo rod with its knots, and this most often perhaps in Turkestan carpets. A similar border exists in some Chinese rugs. It is occasionally seen in Indian rugs and is said to symbolise the power of the law. In carpets made in South India, and occasionally in those made in Persia and Northern India, the "Trisula" appears. The "barber's pole" form of narrow bi-colour or tri-colour border, which is so frequently seen, is said to symbolise the varying lights and shades of human life.

Many of these old forms occur all over the world, and in connection with almost every faith.

Colouring had its own symbolism, and every combination of colours had its own inner meaning, connected often with a flower; white and green represented joy; white alone mourning; yellow, honour and distinction; red and purple, rank and dignity; black and dark-blue, sadness, darkness and trouble.

"Whites, yellows, greens, blues, reds, and black, in cases of the dominant colour of deities and the sacred animals, of the Sun and Moon, were not chosen hap-hazard, but according to the symbolic significance which the Egyptians were accustomed to attribute to each colour—the idea of joy was connected with white and green." *Brugsch*: 'Mythology.' To the old carpet weaver the magnificent Persian blue, the secret of which seems to have altogether died out, symbolised eternity.

One often sees on carpets one or two small patches of colours not used elsewhere in the patterning, and usually not a part of the pattern; these are worked in to avert the evil eye, to keep off sickness or trouble, or to bring in good luck.

There are an immense number of other forms used in the design of Oriental carpets. Doubtless all of them were symbolic, and each had its own general, and inner or more esoteric meaning. Few, if any, of these other forms ever occur as part of the ornament of carpets made in Southern India, hence I am not dealing with them here.

Illustrations of various forms of the symbols referred to above will be found on plates III and IV.

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Carpet weavers consider it a good omen if they find that they have laid an odd number of threads in the warp of a carpet; if the number is even they look on it as indicating much future ill-fortune. The origin of this idea is told in the old legend that the first person who ever laid a warp for carpet weaving was the Devil, but, as he happened to lay an even number of threads, the carpet would not work out right, and he threw the whole thing into the sea in a passion. Lokman, the great astrologer—worker of wonders, and seer of things unseen—next tried, and, as he laid an odd number of threads in the warp, his efforts were crowned with success. He is thus claimed by Muhammadan weavers as the patron of the carpet industry in India. He is said to have got his idea of the weaving from a spider's web, which was sailing down the Ganges on a branch of a floating tree and collided with his boat, just when the story of the Devil's first attempt at weaving was being told to him. Because of this legend, old fashioned weavers often put an extra pair of warp threads into a large carpet.

Some sects of Shiah Muhammadans will not use a prayer rug or carpet unless they have first satisfied themselves that the colour in it is permanent. This is said to be because they fear that prayers said upon it will not be accepted by the Most High. There is no mention of this custom in the Hanafi law.

An old custom, common apparently to all Moslem carpet-weaving peoples, is, that if a visitor to the factory leaves without praising the work on the looms or the carpets in store, he is held to have laid a curse on the work and the master. Fatehas are said, and incense is burnt. If, on the other hand, he expresses his admiration of the work, the master of the house begs him to spit on the carpet being woven, so as to bring good fortune.

THE PATTERNING OF THE CARPET.

"When we approach the study of design, from whatever point of view, and whatsoever our ultimate aim and purpose, we can hardly fail to be impressed with the vast variety and endless complexity of the forms which the term (design) covers, understanding it in its widest and fullest sense."—*Walter Crane*: "The Bases of Design."

Design in textiles naturally divides itself into two main classes—

I. That which is to be woven or knotted into the fabric as a part of the act of weaving, as in carpets, tapestries, brocades, and patterned woven silks, wools and cottons; and

II. That which is planned to form surface decoration and which is to be embroidered, drawn, painted, printed, or otherwise worked upon the fabric; *e.g.*, chintzes, cretonnes, and decorated silks, velvets, etc.

The designing of all textiles coming under the first class, as carpets or tapestries, with which alone we are concerned here, has to be so arranged that the patterns can be worked out in horizontal and vertical lines, and, where the pattern crosses the warp diagonally, in stepped lines. And then only at such angles as the squares, formed by the intersection of warp and woof threads, will admit of. Thus we find that in coarse count carpets, small or sharp curves show a broken outline, and look hard, stiff and unsightly.

The working designs of carpets are generally drawn on section paper, and generally to a scale equalling in fineness the count of the carpet to be woven. Each square represents a knot, or rather the two ends of the pile [see plate II, p. 53]. The diagram is, for convenience of the weaver, usually drawn to the full size of the pattern to be reproduced, and shows either a half, a quarter, or an eighth of the ornament on the carpet. But in the case of an "all over" diaper or repeating pattern, [such for example as the graceful "Herati," or "flowers of Henna" pattern, the fine and simple "Shah Abbas" pattern, the chastely

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beautiful "Mian Khani," and the stiff and heavy, yet attractive design, which bears the name of "Sirdar Aziz Khan"], the repeats are usually in square or oblong blocks. The triangle, diamond, hexagon, and ogee forms of textile repeats are rarely used in the patterning of Oriental carpets. Both the "drop" and the "turn over" forms of repeat are in frequent use. In a few cases a combination of both these forms of repeating gives excellent results.

Border designs are selected for their value and appropriateness as settings or framings for the main or ground patterns of a carpet, and usually for the possibility of their repeating horizontally in fairly long lengths, and for making corner effects without the straining of their general decorative effect.

'It is of paramount importance to recollect that, in the designing of carpets, curves that run for great length, in the direction of the warp or woof, should be avoided. Such, in the coarser or medium grades, would lose much of their character as curves, and appear as disjointed lines placed in steps. The best arrangement is for the curves to be so worked in, where possible, that they run diagonally across the carpet at an angle of 45° as nearly as may be. All curves cannot be made this way, if so they would be fatally uninteresting, but this fact is worth recollecting in the planning of pattern.

The "*talim*," "*ta'alim tereh*," "*raqsha kitab*," or book of the pattern, is in general use amongst the carpet weavers of the Panjab. It does not appear to be known to the trade in South India or the Deccan, [except perhaps in His Highness the Nizam's factory at Golconda, where the workmen are the descendants of Kashmiris]. In it is written in signs—a symbol for each colour, with in some cases a repeater sign—the whole pattern of the carpet. The writing represents, stitch by stitch, the pattern as it is to be woven, line by line, across the width of the carpet. The talim is written from the actual carpet to be copied, or from the ruled section paper drawing. It is a simple and convenient method of recording pattern. It bears handling wonderfully well, if written on good Nepal bamboo paper, and it is far cheaper to make copies of the talim than it is to reproduce section drawings. It is easily taught, and not quickly forgotten.

Throughout India and Persia we find that most floral patterns in carpets occur in nearly natural forms, but the rectilinear always influences the flowing lines of nature. Floral forms of ornament found in carpets are, amongst many others, the Tree of Life, the pink, the fritillaria, the lotus, the rose, the ranunculus, various liliums, the poppy, the scilla, the tamarisk, the myrtle, the henna, the narcissus, and the crocus. One finds too the various parts of these plants, foliage, roots, seed vessels, etc. These flowers are generally depicted in their natural colours. In old carpets it is usually found that the colours employed are "the perfect seven."

Animal life is rarely found to be represented on South Indian carpets, except in the form of a dove or blue pigeon, or of a peacock. This is perhaps natural, for nearly everywhere the dove or pigeon has had a place in the history of religion. Pigeons are connected with Islam in fact as well as in hoary tradition. "The doves of the Kaaba," "Allah's proclaimers," were sacred at Mecca long before the time of the Prophet Muhammed, and are still held in special esteem. They accompanied his flight to Medina, and it is recorded that one appeared to whisper to him there.

Hindu forms of animal life are occasionally found in Ayyampett rugs, and of course also in those made from Persian patterns at the Jails and Art or Industrial Schools.

The way in which the various forms in the patterning of carpets have travelled from one centre to another is altogether surprising, so much so that one is always being confronted with what has been described "as the migration of influences"—influences of symbolism, of colouring, of material, of workmanship, and of design—and over these stumbling blocks the most carefully elaborated theories break down. These influences are so wide spread and

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many, and have become so interwoven together, as to defy explanation. We find Persian and Turkish forms and influences in the work of Southern India and China, Chinese influence in these countries, and *vice versa*, and latterly, and most unfortunately, European influences affecting the whole character of the carpet weaving industries of all these countries. One would think that the possession of a carpet known to have been designed from an old Ellore-Persian pattern, woven by Muhammadan weavers in, say, Ellore, would be some guarantee as to the South Indian origin of that particular specimen. But it is no guarantee at all, for we shall probably find, if we examine it critically, that part of the design is Moghlai, part is Persian and part Central Asian. This is, of course, due to the migratory character of many of the weavers, and to the fact that all Muhammadans are fond of travel, and make frequent pilgrimages to the tombs of saints, and the more important centres of their religion, and that all who can arrange or afford it, try, once in their lives, to make the Haj, or pilgrimage to Mecca. On the way and on the return journey, they meet other weavers, exchange ideas, see other factories, looms and carpets, and so bring back with them new forms and ideas, which they put into their own work.

Yule says—"The carpets of Cocanada [Masulipatam and Ellore makes] are greatly admired; the ground is white, floral scrolls of blue, red, yellow, and brown divide them into regular geometrical spaces like a tesselated pavement; a flowery cone being inlaid in each white space, and the rows of cones thus formed are often alternately coloured red, blue, yellow, and brown. The design is Greek in its simplicity; and in its warmth and glow of colour perfectly Oriental, charming the attention, caught by each colour till the next is seen."

In the colouring of the old South Indian carpets, reds broken by quaint stiff flowers or conventionalised leaves, in which orange generally predominates, form a leading feature; cool, low blues, greens of similar gravity of hue, and soft yellows and creamy whites, form the colour scheme, which all bear marked traces of their Persian origin. British carpet dealers have changed this old Indian system. White in borders is sometimes actually bleached, and hard and garish combinations have been introduced, colours naturally become intensified by being flatly uniform, instead of being broken and slightly varying in shade, as the masses of red and other colours are left by the weavers. English and American dealers have had changes, more or less important, introduced into these Oriental designs to suit the colour schemes of the rooms for which they are ordered, often quite irrespective of such matters as balances and values. Good taste and bad taste are alike catered for, with the loss of the exquisite harmony of the old native arrangements of form and colour.

The carpet trade is not now satisfied with the old rich soft colourings, or the variety of patterns and form, which is available amongst the innumerable fine old designs. The demand, the craving, is for something new, something original. And so, fine old patterns are re-coloured to suit the proposed furnishing of rooms, often to the entire debasement of pattern and colour scheme.

A design undoubtedly made and coloured for a long narrow carpet has its proportions altered, colours changed, and a few additions to the pattern perhaps made, to adapt it to the size needed. But it is generally no longer a copy, often nothing but an ill-bred, bastard presentment of the original.

Designs, which would be excellent on a wall, as a hanging, or as a wall paper, are chosen as likely carpet patterns. And every fresh trained textile designer, with the signature on his South Kensington or other diploma hardly dry, must try his hand at a new carpet design "in my own combinations of form and colour," and this the trade often calls "an Oriental Carpet."

Many of the designs sent out are beautiful adaptations or copies of fine antiques, others are ghastly. I saw the other day a spidery design, in which bilious greens and glaring

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yellows predominated, and from which twenty-four rugs were to be made. These atrocities were for the continent of Europe.

The colour in old textile tabrics seems to result from a sacred gift to the various races that produced them. The best of the early designers of carpets proceeded in accordance with tradition, and a certainty that was often almost instinct. Of all the artistic powers, colour is the most difficult to teach. Though general principles can well be imparted by rule, a true sense of colour is most rare. It seems to prevail in certain cases as a special gift. It often exists where a knowledge of the value of form is unknown. And it accompanies a quiet sense of sympathy with nature.

Savage nations colour their cloths, or wrappers, or mats harmoniously, though they themselves are absolutely devoid of social or mental cultivation. And, on the other hand, as nations have progressed in scientific attainments, the love of colour, in dress generally, in other ways certainly, is diminished. Europe may cultivate the study of colour and understand its laws; but in textiles of all kinds, from carpets and tapestries, to gossamer muslins, and gold and silver brocades and tissues, the real traditional taste of Oriental nations with their old civilisation is still unattainable by Europeans. And of European nations those most old-fashioned, least changed from the rude ages of the past, retain the greatest enjoyment and feeling of colour.

If the civilized nations of Europe do not equal the less advanced and even the savage races in their appreciation of colours, they are even less happy in their application of designs. In Cashmere, and throughout India generally, much injury has been occasioned to the manufacturers, alike to their skill and to their profits, by European purchasers inducing them to undertake designs from Europe, many of which are, in no sense, fitted for use as carpets, although often good enough in their way for many other uses. The deep tints of native Persian and Indian dyes generally, were, for very many years, at once the aspiration and despair of artistic European dyers. The beautiful elaboration in colour and design, as shown in the old work of the weavers of Persia, the Levant, Turkomania, the Deccan, Kashmir, and South and Northern India can only be injured by interference. The old workmen knew that for the coarser wools of South India, the fine designs of Persia, or the patterning of the fine count and densely piled carpets of Turkomania and Kirman are equally unsuitable, and that only bold patterns can be with advantage used.

"True carpets seem to have been early employed in Persia; and those of Turkey were originally introduced by Persian weavers. The Persians still remain unrivalled in those happy combinations of colour and pattern for which their carpets have for so long been distinguished. In them the most varied hues and deepest tints are brought into close approximation, and, far from offending the eye, please by their striking, because always harmonious, contrasts."

Birdwood says of all classes of old Indian carpets, and especially of the old South Indian makes:—"In all these carpets the first thing to observe is the complete subordination of the decoration to the surface. A carpet presents, of course, a flat surface, and the decoration in these Indian carpets, it will be seen, is never allowed to disturb the impression of their flatness. This effect is obtained by representing the ornamentation on them in a strictly conventional manner, and without shadow. The next thing to observe is the skill with which the ornamentation is distributed, nearly always in a symmetrical manner, and with such perfect balance that even where it is most crowded there is no effect of overcrowding. Then, it is interesting to notice the wonderful variation of the same ornamental forms in all these carpets. No two of them present in the details of their decoration actual repeats of each other, yet in most of them it consists of the knop and flower pattern, that is, of the lotus bud and lotus flower, which has been the universal form among the Asiatic Aryans from the beginning of their art history."

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Some one writing of Oriental design, has said recently "that the modern craftsman often uses conventional elements without regard to their meaning"; but the experience of the writer is, that some of them can still see in their designs, "the opening flowers, the gliding fish, and hear the twittering birds; and can feel that they are walking under the curling clouds that arch over the interlacing branches of the richly laden fruit trees." True it is that this feeling is being killed by those who would push the trade in Indian carpets, and treat this art industry as an ordinary manufacture, and by those too who would force upon the workman foreign ideas to which his artistic feelings can never respond."

"A good type of carpet is the so-called Heráti kind. These, doubtless, had their origin in Herát, but have long been produced in India, notably in Lahore, Amritsar, and Agra, [also in the large jails, and often in South India.—H. T. H."]. In 1863, according to Balfour, "upon the carpet industry of Herát being temporarily suspended, most of the weavers emigrated to Birjand. The earliest examples are remarkable for the boldness of the curving stems and the soft cool harmony of the colour, in which is found a good deal of a fine green and deep blue. The border consists, usually, of a broad band separated from the centre and edged on the outer side by one or two very narrow bands. On the broad band, bold and highly conventional flowers alternate with long serrated leaves carried on delicate and gracefully undulating stems." The most striking feature in all these early carpets is the appreciation for the ground, and the proper restraint in the "quantity" of the pattern. There is something Imperial in the great curves and bold touch of the designers, who command ample breadth while achieving extreme closeness of stitch. Their work never looked crowded, and there was always a proper proportion of border to field. To the artist and designer, one of the most striking features of these Heráti designs is the extremely skilful choice and use of outlining colours. "To instance a few examples—on a deep red ground a rose pink will be outlined delicately with white; a dull yellow, with dull green or pale blue; a dull green with white, and a deep indigo with dull yellow. On a dark blue ground we find light blue outlined with dull yellow; red with white; dull yellow with salmon pink, and so on.

A few modern carpets, made in India after the old patterns, are quite equal in quality to the early ones; but, as a rule, the weaver of to-day has not the broad ideas and fine sense of form and colour of his ancestors. "His patterns lack repose, he somehow misses the spirit of the early work. The whole carpet seems somehow to suggest bustle and business—London, Vienna, Paris or New York—that it is part of a consignment for a bustling firm. Or it is too geometrical in its arrangement, as is usually the case with the silken carpets of Warangal in the Deccan. And there is no doubt that the material used to-day is not equal in quality to that of the past. Business considerations put 'mixed' wool into the work." [The use of such wool leads to uneven 'mellowing,' and to a poor patchy effect.—H. T. H.]

"Dyeing has been much affected by Western influences and by common imported German dyes. The old Persian test of dropping a piece of live charcoal on to the face of the carpet, to see if any traces of the injury remained after brushing away the singed top, is one we should not care to apply to any modern carpet." *Andrewes* 'Journal of Indian Art,' Vol. XI. [I have found by actual experiment that a well woven 12 stitch carpet will safely stand this test.—H. T. H.]

Sir George Birdwood's views on "The Termless Antiquity . . . of Oriental Carpets" Vienna Carpet Book—are worthy of reference here.

"The decoration of textile fabrics was at first extremely ritualistic, and pre-historically it would seem to have originated in tatooing, from which the rich symbolical vestments worn by kings and priests have, in great part of the world, been obviously derived. The practice was once universal and is still widespread, and where it yet survives is invariably ritualistic, indicating the relation of those so 'stigmatised' to their tribes and tribal divinities . . .

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Already at the time of the composition of the Iliad and Odyssey these textiles had acquired the ritualistic Euphratean types by which they have ever since been predominantly characterised throughout Central, Southern and Western Asia, as also in their passage through Phoenicia and Phrygia into Europe." He considers that "the coloured slabs and other decorations discovered by Layard in the ruins of Nineveh and Babylon all incontestably prove that, in design and colour, the carpets woven in India, Persia and Central Asia to-day, are the same class of carpets as were used for awnings and floor covering in the palaces of Sargon, Sennacherib, Esarhaddon, and Sardanapalus, "the great and noble Asnapper" of the Book of Ezra. The stone slab from Koyundjik [palace of Sennacherib, B.C. 705–681], and the door sill from Khorsabad [palace of Sargon, B.C. 722–703], are palpably copied from carpets, the first of the style of the carpets of South India, and they were probably coloured like carpets.

"The South Indian carpets probably approach in their bold designs and archaic force of colouring nearest to their Euphratean prototypes . . . The Italianesque style introduced in the treatment of modern North Indian and Persian carpets, and with local modifications of the Ellore, Masulipatam and other denominations of Indian carpets, if somewhat of a departure from the traditionary Euphratean mode is yet undeniably pleasing, and on account of its broken patterning and generally diffused colouring, better adapted to carpets intended for European rooms, where they are overcrowded and overshadowed by the furniture, than the severely co-ordinated designs and immense masses of clearly-defined, deep-toned colours of the more unsettled parts of Persia.

"Notwithstanding, however, the sweet charm of the Abbasi Persian carpets of modern trade, the palm for pre-eminent artistic merit above that of all other denominations of Oriental carpets now manufactured for merely commercial gain, must be awarded to those of Southern India for their perfect adaptability to European domestic uses, and on account of the marvellously-balanced arrangement of their colossal proportions, and the Titanic power of their colouring, which in these carpets satisfy the feeling for breadth, and space, and impressiveness in State furniture, as if they were indeed made for the palaces of kings and the temples of the gods: and these Southern Indian Carpets, the Masulipatam and Ellore makes derived from the Abbasi-Persian without a trace of the Saracenic or any other modern influence, or both, relatively to their special applications, the noblest designed of any denominations of carpets now made."

EXTRACT FROM MONOGRAPH ON THE WOOLLEN FABRIC INDUSTRY OF THE MADRAS PRESIDENCY.—E. THURSTON (1898).

"I may with advantage quote from an industrial report by the Hon'ble Dr. D. Duncan, Director of Public Instruction, who writes as follows:—'Carpet-weaving is carried on, more or less, in seven districts, the chief seats of the industry being, however, Ellore, Masulipatam and Ayyampet. The industry has sadly declined as regards the extent to which it is carried on, and, some think, in the style and finish of the manufactured article. On a recent visit to Masulipatam, I found that the industry had, in recent years, shrunk in extent, and deteriorated in the quality of the carpets. I visited several of the principal carpet-weaving establishments, but in none of them did I see anything, which could be favourably compared with the high-class carpets and rugs of Ellore. At Ellore the industry has dwindled into comparative insignificance. This may be due, not to a falling off in skill on the part of the weavers, but to the fact that no high-class carpet had been ordered about the time of my visit. There are now only sixteen important weaving establishments, and carpets and rugs are almost entirely made to order. The industry is carried on almost exclusively by Muhammadans, who, like this community in most other places, are very poor. They have

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no capital, wherewith to purchase the materials or to maintain themselves during the time the carpet is being made. Consequently, when a carpet is ordered, an advance of money must be made. Some Madras firms, such as Messrs. Arbuthnot & Co., have an agent at Ellore, who advances the money required by the carpet-weavers, and generally superintends the execution of the work. The carpets are mostly intended for the European market. The approximate annual value of the carpets manufactured at Ellore is Rs. 100,000.'

'It is a great pity,' Dr. Duncan continues 'that an industry so highly spoken of should be allowed to decline, until it threatens to become extinct. The excellence of the colouring is no doubt due to the fact, regarding which I made enquiries when I visited the carpet-weavers at Ellore, that only native dyes are used. There are ten principal colours, viz., white, green, orange, rose, red, black, sky-blue, burnt-umber, ivory-white and kháki. The patterns, I was informed, were brought by Kabul merchants many years ago. The old patterns are strictly adhered to, unless customers wish it otherwise; but any simple pattern can be imitated. The preparation of the dyes, and the dyeing of the wool, are done by the women of the family; the weaving being done by the men and boys. The weaving is carried on in sheds, which are generally somewhat deficient in light and ventilation. The poverty of the carpet-weavers is the chief obstacle in the way of improvement, and, in addition, there are, as Mr. Havell says, 'the unbusiness-like habits of ordinary native workmen.' A steadily growing demand for the best productions of the looms would tend to ameliorate the economic condition of the weavers, and, by alleviating the extreme pressure of dire necessity, might, in course of time, permit of the growth of keener artistic sense, and greater pride in their work, and a determination to maintain a high standard of excellence in material design and finish. At present the poverty of the workers tends to keep ever prominently before them the immediate money return, which they look to for their labours —a condition most unfavourable to excellence of workmanship.'

"The following information, bearing on the subject of the Ellore carpet industry, was elicited in the course of an interview with Messrs. Arbuthnot & Co. Four primary patterns are, at the present time, being shipped to London under orders from the firm of Messrs. Maple & Co., viz., Ashan Khány, Parsey Khány, Gulbundi Umbasha Khány, and Gopal Rao Khány. The demand is greatest, in the English market, for the two first. Vegetable and other indigenous dyes are used. Sometime ago the Superintendent of the Vellore Jail asked Messrs. Arbuthnot & Co. to ascertain how the beautiful Indian red vegetable dye was made. The information was not forthcoming, as the preparation of the dye was said to be a secret process, handed down, like that of the manufacture of some liqueurs, from generation to generation. Carpets with an Indian red centre look like silk, when made of extra quality. The different qualities of Ellore carpets, now manufactured, are as follows:—

(*a*) Ordinary—Rs. 6–8–0 per square yard delivered in Madras.

(*b*) Exhibition—Rs. 10 per square yard.

(*c*) Extra exhibition, containing 144 stitches to the square inch, Rs. 12–8–0 to Rs. 15–0–0 per square yard.

"The size of the carpets averages from 7′ × 4′ to 30′ × 20′. The so-called white centre of the carpets is really camel or ivory [creamy] white, the former being the darker. [As Mr. Dresser points out, 'If the ground of a carpet is pure white, it is almost impossible that it looks well. When I make this assertion, I am often told that some of the Indian carpets, which I do so much admire, have white grounds. This is a mistake. Some of them have light grounds, but not pure white. They have light creamy-grey, or green-white grounds, but not pure white, and this variety of tone altogether alters the case.'] At the present time there is a demand for the 'Jumphul' border by all orderers of carpets. The

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Ellore agent has received four old patterns, which he sends out with numbers, but without specific names. Nearly all the carpets are made on an imported English hemp-twine foundation. Occasionally a cotton foundation is used; a carpet on a hemp-twine foundation will not spoil if it happens to get wet. The carpet-weavers at Masulipatam imitate the Ellore patterns, but use inferior materials, and the workmanship is indifferent. They put them on the market at a cheaper rate, and undersell Ellore. The twine is mixed with 'Jute' from the Bombay mills, and mineral dyes are used. Some years ago Messrs. Arbuthnot & Co. executed an order for ready-made Masulipatam carpets at the instance of an American firm in Boston. But the result was not a success, as the carpets wore badly. One effect of the competition of jail-made carpets is said to have been that the hereditary weavers receive advances of money from the principal carpet manufacturers, and it is then difficult to get any work out of them, as the rates are so low.

"The demand for Ellore carpets seems to be fairly well maintained, as Messrs. Arbuthnot & Co. supply them annually to the value of 1½ lacs of rupees. Messrs. V. Robinson & Co. have a loom at Ellore, with a Muhammadan agent who is under engagement with Messrs. Arbuthnot & Co. to supply them only with carpets.

"The suggestion has been put forward by Dr. Duncan that, if carpet-weaving is continued at the Madras School of Arts, two or three scholarships might be offered yearly to boys belonging to the carpet-weaving families in Ellore, Masulipatam, and Ayyampet, to enable them to join the School of Arts. On completion of their school course, they would mostly return to their homes, carrying with them wider and more accurate knowledge, and, if not a higher manipulative skill, a more intelligent appreciation of the technique of carpet-weaving. The experiment would seem to be well worthy of a fair trial, provided that the lads' parents will allow them to quit their ancestral home; and their consent to such a measure is by no means certain.

"In 1895 a Committee, with myself as Secretary, was appointed to report to Government on the working of the Madras School of Arts. In connection with carpet-weaving, the Committee submitted a series of questions to the officiating Superintendent, Mr. E. Holder. These questions, with the replies thereto, were as follows:—

1. Number of weavers engaged and where they were obtained from.	Three men were engaged when the class was first started, one from each of the three towns famous for carpets in South India, *viz.* Warangal, Ellore and Ayyampet. At present there are two weavers, the Warangal man having left the school in 1892. These men act as teachers to students who do all the weaving as class work. For urgent orders, passed students from the Anjuman and the School of Arts are occasionally engaged on daily wages.
2. Pay of weavers.	The two Maistries are paid Rs. 40 and 20 per mensem, respectively. The extra men employed for urgent work receive from 4 to 6 annas per day. Students learning the work are paid stipends from Re. 1 to Rs. 7-8-0 per mensem according to progress made and examinations passed.
3. How are patterns selected?	In this, as in all the other industrial classes in the school, students are taught to make their own designs, always keeping in view as examples of the best carpets those illustrated in 'Oriental Carpets' and the coloured designs sent from the South Kensington Museum, which are sometimes copied, with slight modifications, when specially required by any person.

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4. What dyes are used?	Only pure native dyes are used, no aniline dyes. All the dyeing, except indigo, is done in the school. White, brown and sometimes black wool is obtainable in the natural state. For blue of various shades indigo is used; for black, sulphate of iron and gall-nuts; for red, stick-lac; for yellow, turmeric, and the patas or moduga flower (*Butea frondosa*). The secondary tints are obtained in the ordinary way by mixing two of the primary colours together.
5. Size of carpets made. Any demand for sma'l rugs?	The looms in the school are constructed to weave carpets of various widths from 3 feet to 21 feet, and of any proportionate length. Very large carpets are not much in demand here owing to the costliness of the material, the price being from Rs. 8 to Rs. 12 per square yard. For very small rugs too the demand is not great. The sizes generally ordered range from 7′ × 4′ to 15′ × 9′.
6. Number and value of carpets manufactured since the industry was started.	About fifty carpets have been completed up to date.
7. Is demand in excess of supply?	This being a class for instruction, and the majority of the students being mere boys, who, in addition to weaving, have to attend the drawing and general education classes daily, the work turned out is not even half of what could be done in a regular manufactory employing adults. The demand, therefore, is in excess of supply, as is the case of all the other industries in the school, except pottery.
8. Have any of the weavers gained employment outside the school? If so, where?	*No students trained in this class have at any time obtained employment as weavers outside the school. They join the class merely for the sake of the scholarships, which enable them to continue their studies in the drawing classes for the group certificate and diploma.* Most of the students from this class, after completing their course, have gone out as drawing teachers or draughtsmen.
9. Is there a field for skilled weavers outside the school?	Local enterprise, I may safely say, has been completely ruined by the jails taking up this industry. The best carpets now manufactured in this Presidency are those turned out in Vellore and Bangalore Jails, so far as texture is concerned, and even design, for illustrations of the best carpets can now be very easily procured. Besides, what they do in jails ordinarily is to have a few select patterns of borders and ground, which are repeated over and over again, with slight modifications, as regards color, proportion, &c., the work being intended merely to keep the prisoners employed. The men generally put to such work are the 'lifers' and 'long-term men,' who, by constant practice, become really expert weavers, as good in the technical portion at least as any professional.

"The Committee noted that no students, trained in the carpet-weaving class, had at any time obtained employment as weavers outside the school, but that they join the class merely for the sake of the small scholarship, which enables them to continue their studies in the drawing classes. In view, however, of the proposal for the establishment of a school of dyeing, the Committee considered that the carpet-weaving industry should not be abolished at any rate for the present, and suggested the advisability of attention being paid to the improved manufacture of small cheap rugs of good design, instead of the manufacture of large and costly pile carpets." E. THURSTON.—'Woollen Fabric Industry of the Madras Presidency,' 1898.

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LIST OF QUESTIONS, UPON THE REPLIES TO WHICH SOME OF THE INFORMATION GIVEN IN THIS MONOGRAPH IS BASED.

1. What is the number of carpet weavers working in the District, or in your factory?
2. (*a*) What is the average size of looms?
   (*b*) What is the length of the largest looms in use?
   (*c*) What is the total number of looms?
   (*d*) What is the total length of loom space, in feet?
3. Do the weavers combine agriculture or other occupations with weaving?
4. Do the families of the weavers work at cleaning and spinning wool, and weaving, dyeing, etc., or is this done by the men and boys only?
5. From whence do the weavers get their wool? is it ready spun, or do they tease, clean, wash and spin it themselves? describe the methods in use.
6. What qualities of carpets are principally made? State stitch counts per inch.
7. Describe the wools in use, and send samples of yarns.
8. Are cotton, hemp, hemp and jute, or jute yarn or thread used for warping and for wefting?
9. How are the weavers paid; if piece work, state the number of stitches per rupee, and the quantity of a given stitch count usually woven in a day by a steady weaver?
10. What is the class of carpet or rug usually made?
11. To what market does the output go?
12. What is the finest stitch grade carpet or rug that is made?
13. And the coarsest?
14. State your experience, so far as cost, colour-value, and permanency are concerned, of—
   (*a*) Vegetable and other indigenous dyes.
   (*b*) High class alizarine, chrome, and other fine chemical dyes.
   (*c*) Cheap low-grade aniline dyes.
15. Has synthetic indigo been given a trial; if so, state your experience of it, as compared with the indigo made in the Madras Presidency, or other make of indigo known to you?
16. Describe in detail the process followed for preparing the indigo for use, and in dyeing with it?
17. Have you any knowledge of either of the following dyeing processes for indigo; if so, state your experience of those known to you?
   (*a*) Indigo, ferrous sulphate and lime.
   (*b*) *Sour vat*—indigo, lime, crude soda, and jaggery.
   (*c*) *Sweet vat*—Indigo, lime, latti, and jaggery.
   (*d*) Indigo and sulphuric acid; sulphindolic acid, (*neel-ka-marubba*).
18. State the ingredients, quantities and processes employed to dye 10 lb. of woollen yarn in the following colours:—

19. Deep crimson.
20. Scarlet.
21. Terracotta.
22. Copper red.
23. Orange.
24. Dull old gold.
25. Deep yellow.
26. Bright yellow.
27. Lemon yellow.
28. Pale blue.
29. Deep blue.
30. Sapphire blue.
31. Purple.
32. Sap green.
33. Light green.
34. Pea green.
35. Olive green.
36. Bronze green.
37. Grape green.
38. Dark brown.
39. Nutty brown.
40. Light brown.
41. Khaki.
42. Buff.
43. Camel colour.
44. Cream.
45. Deep rose colour.
46. Pale rose colour.
47. Flesh pink.

48. Is the dyed yarn washed in running water, or steeped to remove excess dyes? And is it beaten? if so how often, or for how long?

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49. Are "topping," over-dyeing, or second dyeing with anilines or alizarines practised, to bring up brightness in dead dull shades?

50. Do you know any way of removing the offensive smell from dead, or "chunam" wool, without making it harsher and more brittle, if so please state it?

51. Is there a ready sale for carpets? state sizes, designs, and quality in most demand.

52. It is understood that large numbers of carpets, and rugs (especially the latter), are made for consignment and shipment to the auction and sale warehouses in Cutler Street, London. Has this largely affected the local "order trade," which used to be a considerable factor in the industry?

53. What designs are in most demand for the warehouses, and what for the order trade?

54. Are many designs, which are either combinations of antique patterns, original European ideas, re-casts and recolourings, sent out from England or other countries to be copied?

55. Are shipment or warehouse carpets usually woven against advances, or are advances only given when the goods have reached the hands of the shipping agents on the coast?

56. Has Indian mill-spun or imported hard twist woollen yarn been tried for fine carpets? if so, what opinions have been received regarding such from the trade or from customers; give, please, your own opinion also.

57. How does the present price of wool and woollen yarn compare with the prices ruling in 1903, 1904, 1905, 1906.

HENRY T. HARRIS.

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STATISTICS.

A.—Statement showing the Sea-borne Trade in Carpets and Rugs from Madras Ports from 1895–96 to 1905–06.

Years.	Imported from Foreign Countries.		Exported to Foreign Countries (Indian produce).		Remarks.
	Quantity.	Value.	Quantity.	Value.	
	LBS.	RS.	LBS.	RS.	
1895-96	* 2,614	3,017	389,780	2,00,292	
1897-98	10,564	10,340	584,814	3,17,690	
1900-01	17,875	22,684	234,245	2,15,389	
1901-02	11,600	15,666	171,605	1,82,610	
1902-03	12,742	18,351	206,600	2,11,076	
1903-04	17,024	16,601	253,319	2.57,053	
1904-05	22,894	18,695	238,717	2,09,724	
1905-06	15,925	22.833	277,892	2,21,608	

* From November 1895 only.

B.—Statement showing the Exports by Sea of Indigo and other Dye-stuffs to Indian Ports as well as to Foreign Countries, for a series of years from 1880–81 to 1905–06.

Years.	Indigo (Indian Produce)				(Indian Produce) Other Dye-stuffs			
	Exported to Foreign Countries.		To Indian Ports.		Exported to Foreign Countries.		To Indian Ports.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	CWT.	RS.	CWT.	RS.	CWT.	RS.	CWT.	RS.
1880-81	25,295	62,35,270	702	1,80,873	181,915	5,36,939	76,293	4.16,219
1890-91	40,696	89.41,214	267	55,640	158,271	5,06,733	135,608	11,94,869
1895-96	62,425	1,40,21,259	423	84,443	163,847	4,66,134	152,525	8,91,312
1897-98	48,165	1,06,64,447	1,442	2,54,528	88,484	2,55,160	95,498	7,34,052
1900-01	18,940	39,25,851	43	10,200	178,106	6,41,091	87,329	10,14,893
1901-02	25,400	49,33,525	369	61,049	144,263	5,08,047	140,421	15,84,770
1902-03	32,242	49,13,604	498	1,11,201	173,114	5,66,648	138,879	9,75,051
1903-04	24,414	38,39,663	40	8,336	133,873	3,90,308	74,982	4,56,545
1904-05	11,901	16,85,409	...	...	224,616	7,00.518	58,272	3,34.137
1905-06	7,756	11,56,349	...	...	227,041	6,81,484	40,158	3,21,415

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a

b

RUGS MADE IN THE VELLORE CENTRAL JAIL. Both are forms of the "Fish," "Herati" or "Collector" pattern.
(b).—Shows the crescent leaf, in a fish-like form, especially the midribs and general outline, which suggest a fish in motion. The border of (a) is a frequent Moghul form.

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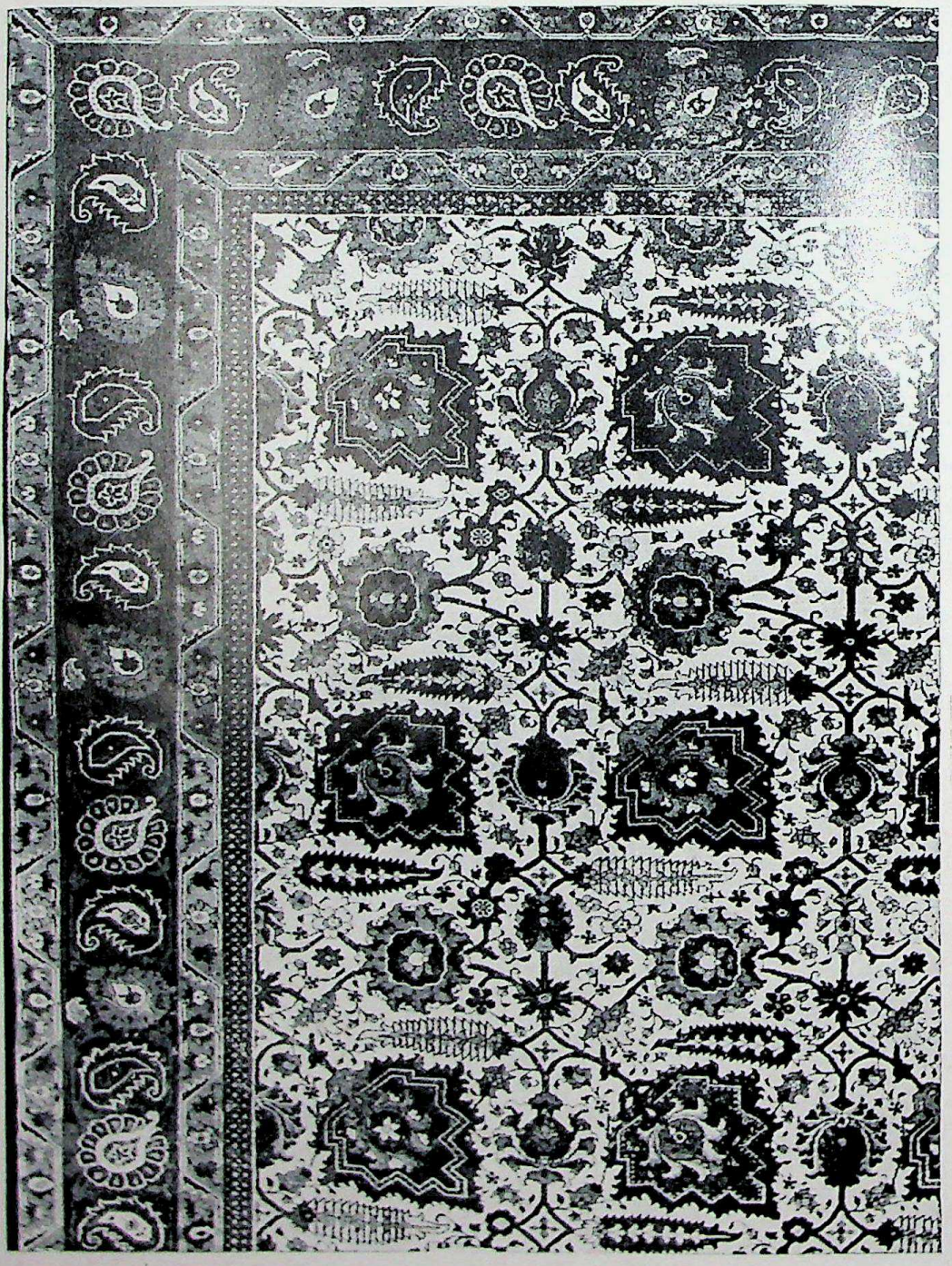

CARPET MADE IN THE SCHOOL OF ARTS, MADRAS.

The border illustrates three forms of the 'cone of flame' or 'pine' device. The ground is a slight variant of a Persian design in 'The Vienna Carpet Book.'

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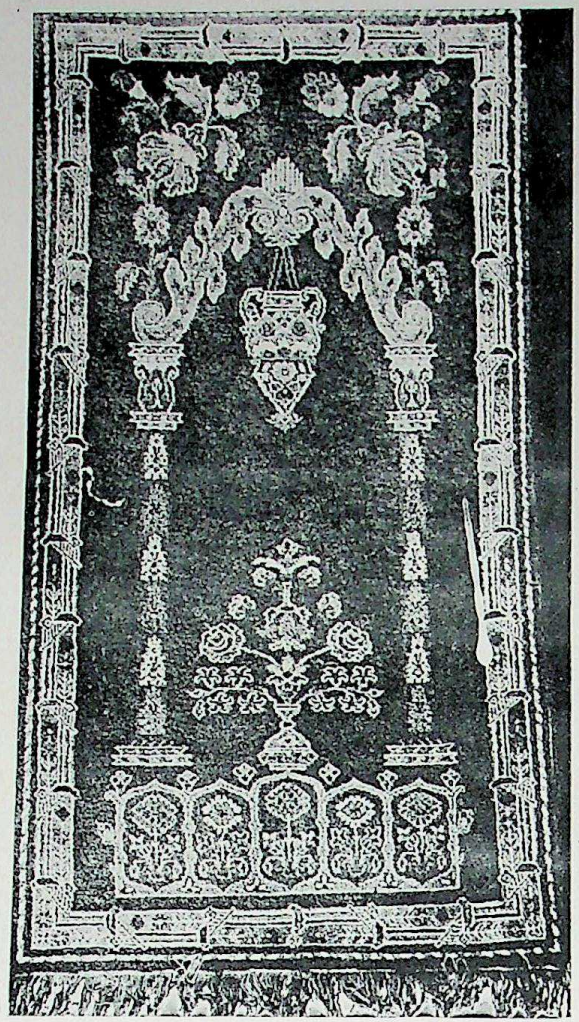
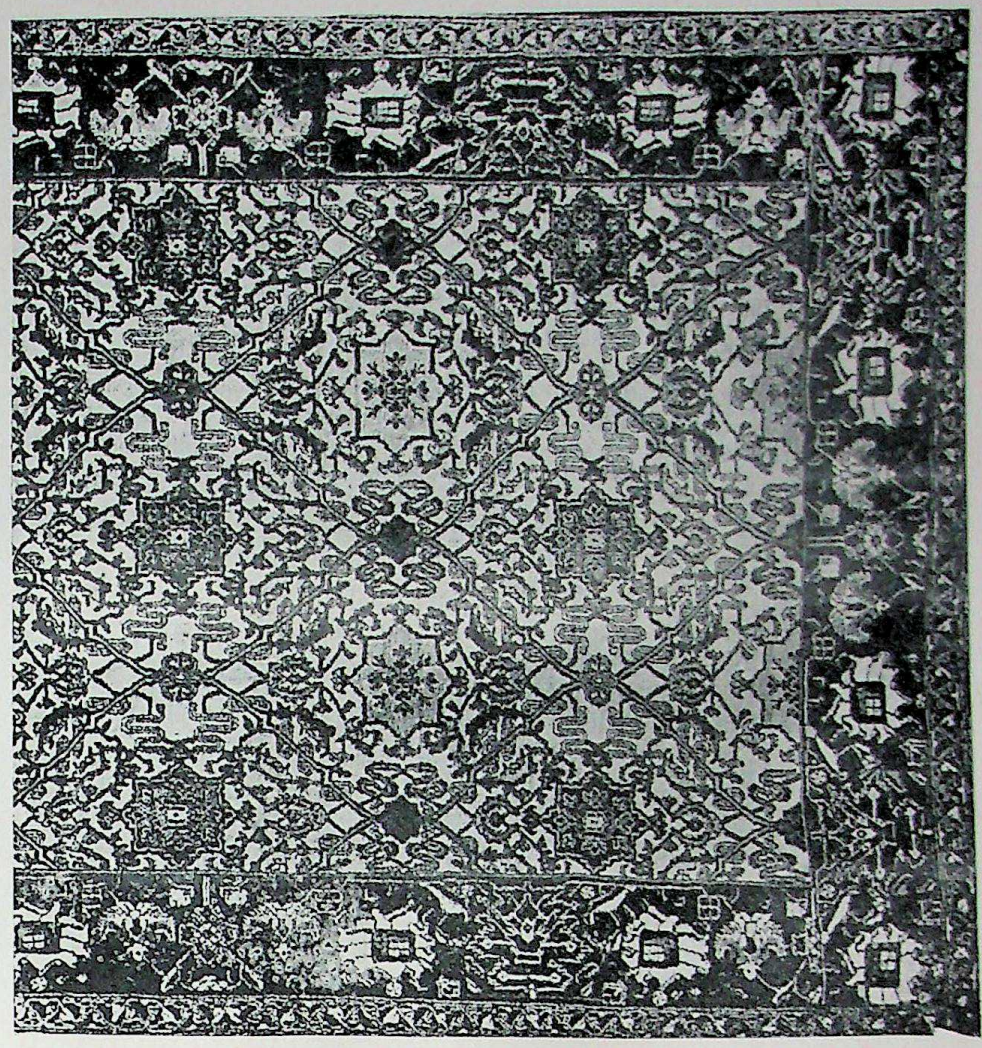


a.



b

a.—PRAYER RUG MADE AT THE ANJUMAN INDUSTRIAL SCHOOL, MADRAS. The three forms of flowering plants represent various forms of the Tree of Life. The Arch (*mihrab*) and the border are very uncommon, and suggest marked Chinese, or possibly Malayan influence. The lamp represents the lamp of faith, or lamp of Islam.

b.—CARPET MADE AT THE ANJUMAN INDUSTRIAL SCHOOL, MADRAS. This pattern is said to have been originally adapted from an old Moghlai rug. The cloud bands in the ground have been changed and compressed into something of the semblance of headless snakes. The border is a good old Lahore one.

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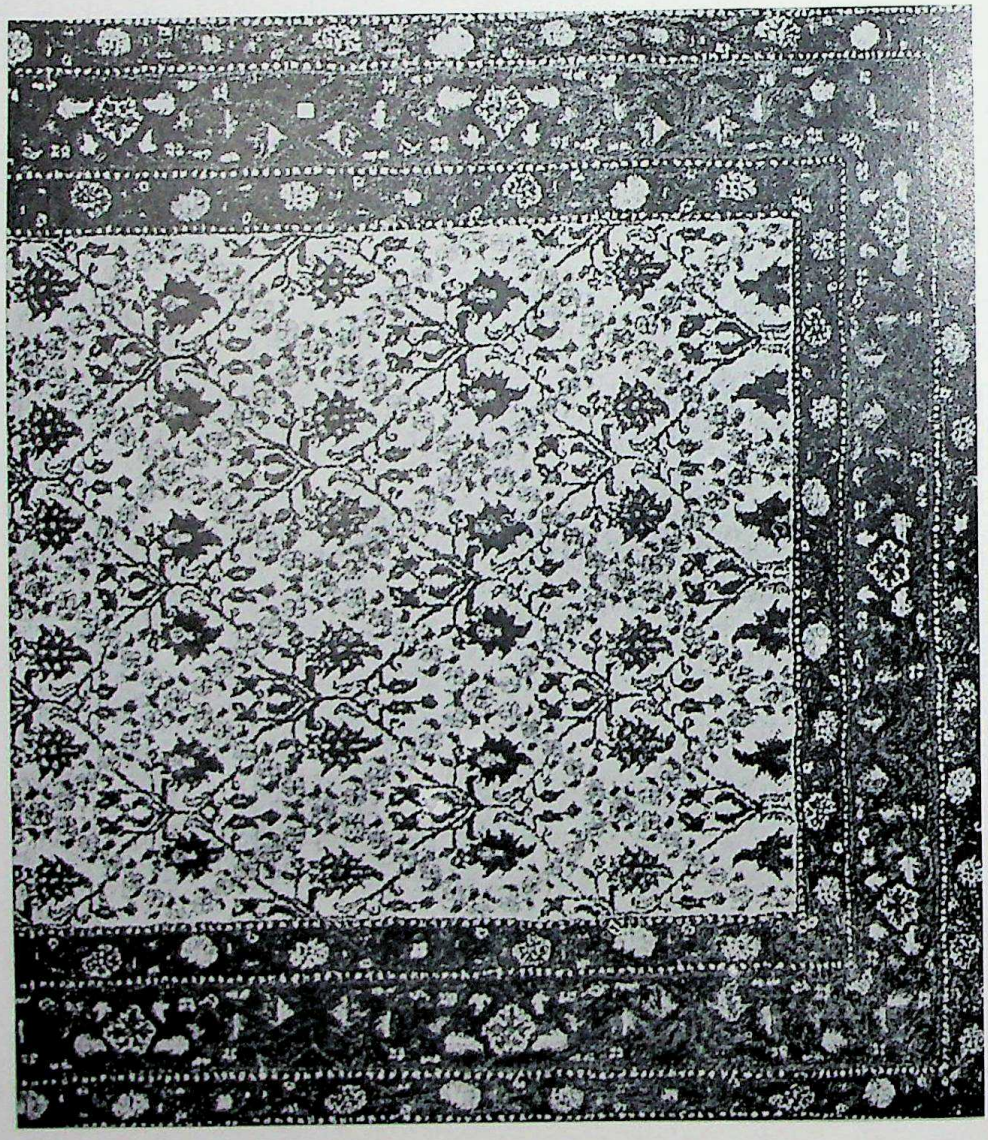

CARPET MADE AT THE ANJUMAN INDUSTRIAL SCHOOL, MADRAS
The design is a local (Ellore) modification of an old Moghlai pattern

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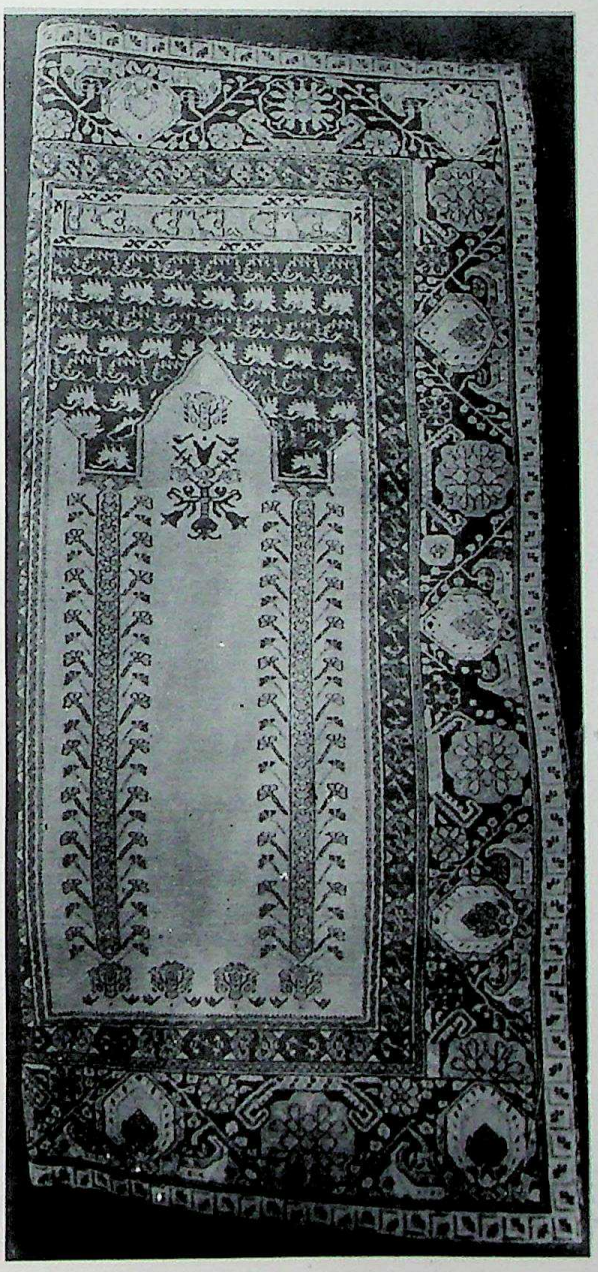

PRAYER RUG MADE AT THE ANJUMAN INDUSTRIAL SCHOOL, MADRAS.

The original was made at Eliore about 60 years ago, and was probably copied from an old Ghiordes (Anatolian) rug.

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RUG MADE AT THE ANJUMAN INDUSTRIAL SCHOOL, MADRAS.

The original was probably an old Moghlai carpet. Old Ellore weavers say that, many years ago, rugs to this pattern were made there, and that "Furreed Khan" brought the original from Bijapur, but with an altogether different border. The design is not now in Ellore.

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a.

b

a.—FIBRE CARPET FROM THE COIMBATORE CENTRAL JAIL. A much debased form of one of the old Lahore "flower garden" designs.

b.—COTTON CARPET FROM THE COIMBATORE CENTRAL JAIL. A much attenuated form of the Ellore "Persian" pattern.

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a

b.

ELLORE-MADE RUGS, a "Garden" pattern; has lost much character from weaving in coarse stitch quality.
A DIAPER in two grounds patterns. Good specimens of Ellore "trade" rugs.

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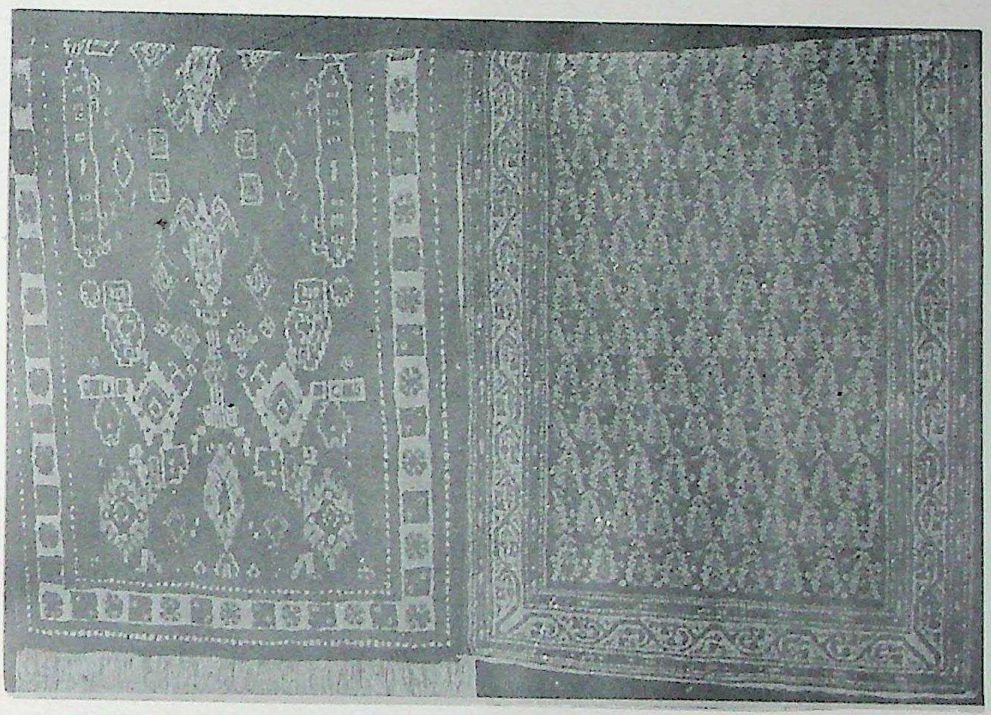
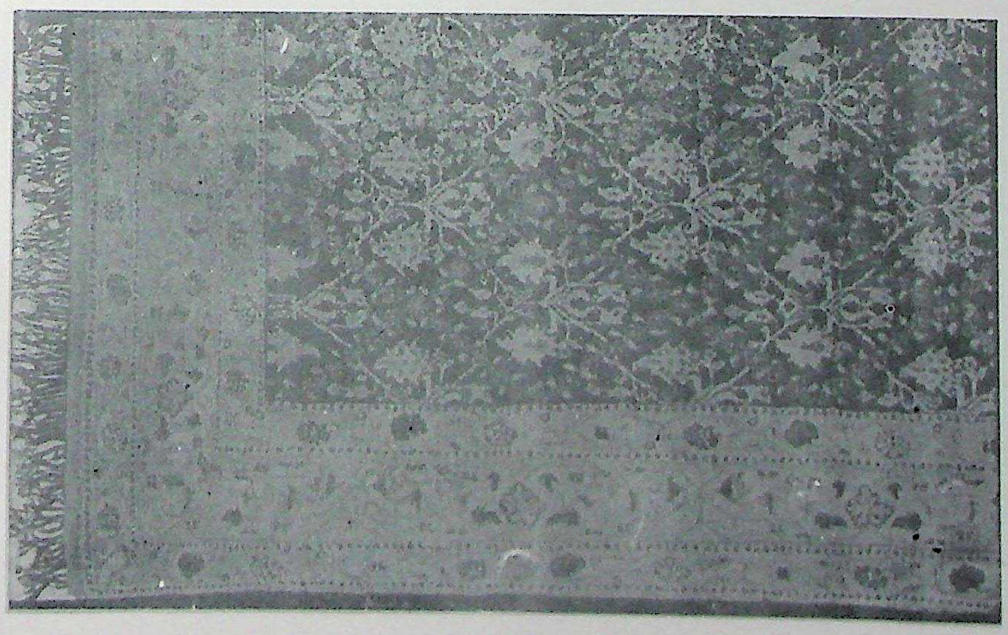
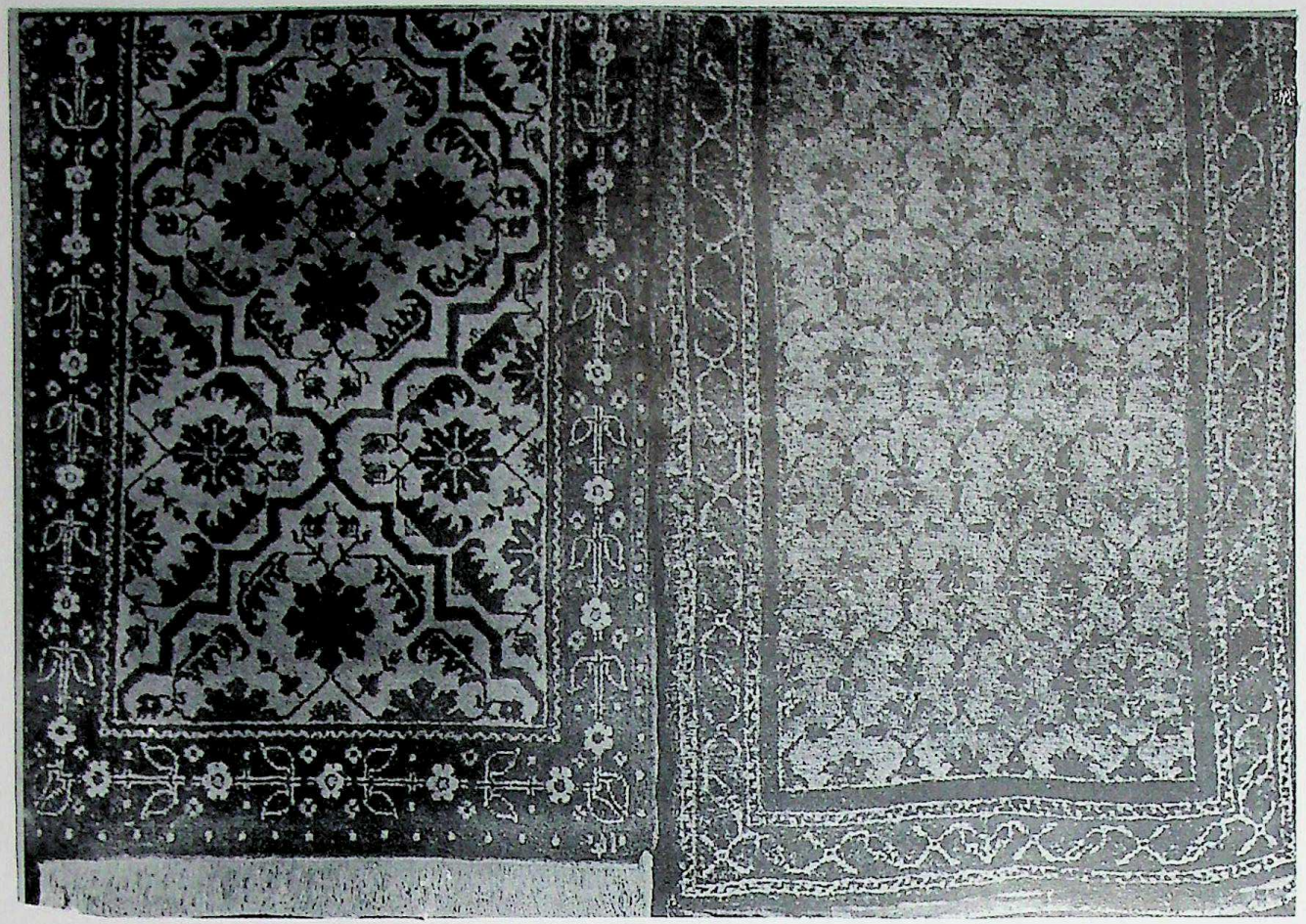




a b Rugs from the Rajahmandry Central Jail.
c Carpet from the Vellore Central Jail.

a, is apparently a comparatively modern attempt at copying a "broken pattern" Turkistan rug.
b, a form of the Crown jewel, Pine, or River loop device.
c, is a local form of a Flower-garland pattern of Moghlai character.



a. b

a.—RUGS WOVEN IN THE COIMBATORE CENTRAL JAIL. In coarse counts, and in, a, wool, and b, fibre.
a, is the old Shaniva Khani pattern; and b is the Gopala Khani of the Ellore weavers. Both are very old patterns

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a.

D.

RUGS MADE AT ELLORE. a.—Old Ellore pattern, with a "Latch-hook" border.
b.—A DIAPER from a Warangal pattern. It is probably a debasement of a "Garden" or nosegay pattern. These are good types of "export rugs."

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a.

b

a.—RUGS WOVEN IN THE COIMBATORE CENTRAL JAIL. In coarse counts, and in, a, wool, and b, fibre.
a, is the old Shaniva Khani pattern; and b is the Gopala Khani of the Ellore weavers. Both are very old patterns

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a.

b.

RUGS MADE AT ELLORE. a.—Old Ellore pattern, with a "Latch-hook" border.
b.—A DIAPER from a Warangal pattern. It is probably a debasement of a "Garden" or noseday pattern. These are good types of "export rugs."

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An undoubted Moghlai pattern. A slight variant from it is the main ornament of a rug in the Jaipur Museum made in the Bangalore Central Jail.

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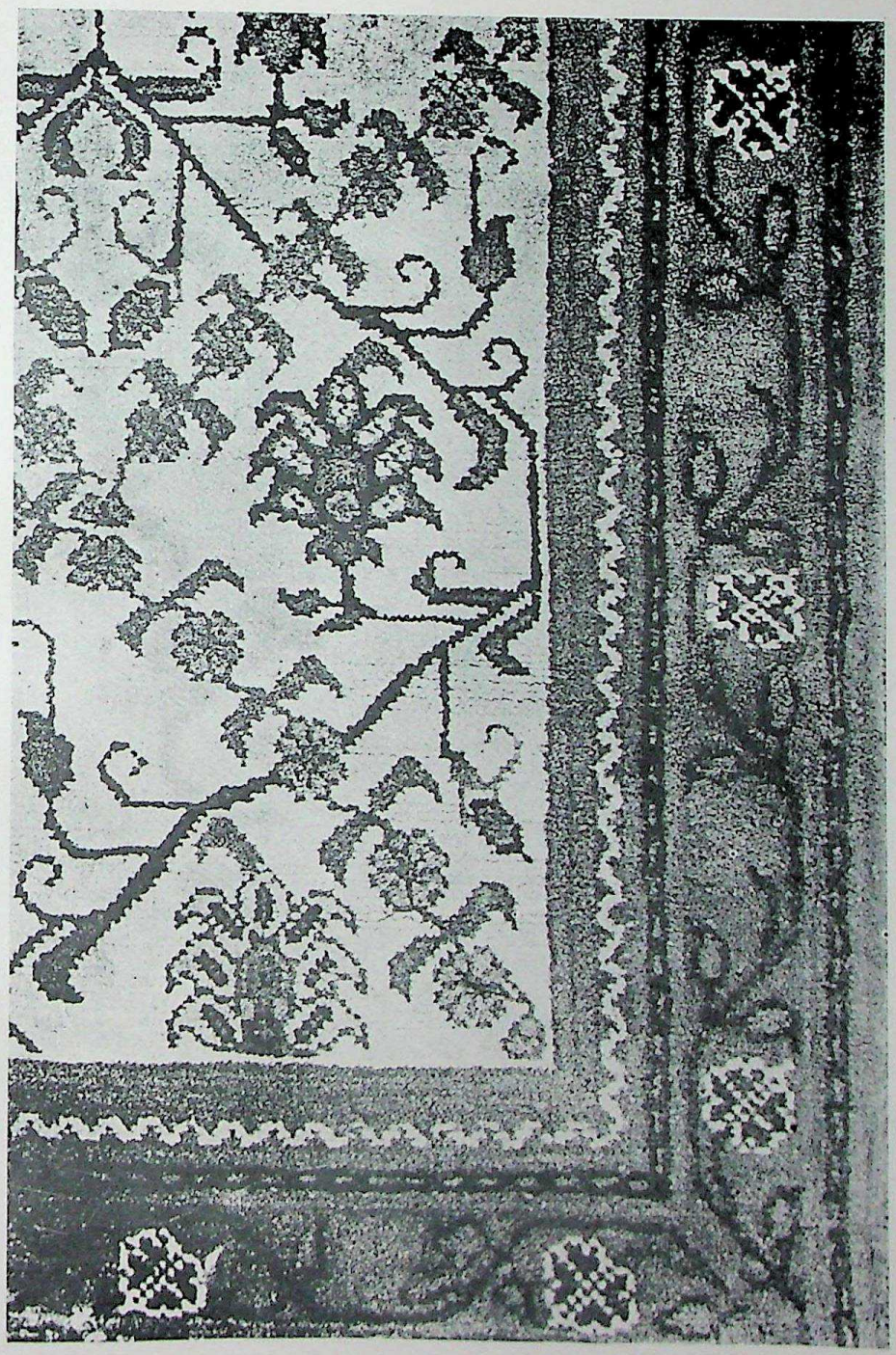

This much resembles an old Agra design, probably in its origin Persian, through Lahore As now made in Bangalore, the pattern illustrated is in much less detail and gracefulness than the old Walajahnagar form of the design. Made by Messrs. Subbiah Chetty and Co., Bangalore

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The ground pattern is a form of the Birjand-Sehna-Herati variant of the well-known Feraghan pattern, arranged with a quite uncommon stiffness and harshness. The border is also a stiffly drawn form of the "Cone of flame," "Crown Jewel" or "River loop" device. Made in the Bangalore Central Jail.

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XVIII. Century design, somewhat of the character of a Multan design. Pattern appears to be rarely made. Border is apparently based on the Pæony. Made in Bangalore Central Jail.

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a. b. c.

RUGS MADE IN THE RAJAHMUNDRY CENTRAL JAIL.

a.—A form of an old Moghlai garden or bouquet pattern, but all the flowers are of one kind.
b.—An old form of the Ellore Aushankhani, rather spoiled by being woven in a coarse count.
c.—Apparently a local combination of the Herati fish pattern and the design of b. All these rugs are woven of fibre, not wool
Colours, unfortunately, are mostly anilines.

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This, and Plates 23 and 24, illustrate some of the oldest and best of the Coast (Ellore and Masulipatam) designs. The photographs are from pattern pieces in the Madras Museum, which are apparently 50 or 60 years old. The colouring of all of them is good; most of the black wool has perished, owing doubtless to the presence of sulphate of iron in the dye. The wool is soft and long-stapled.

a. RAMACHANDRA RAO.—Said by the weavers to be one of the patterns that came to the Coast with the early settlers; is not in very frequent use.

b. ASHAM KHANY.—Probably the best known of the old Ellore patterns; has many points of resemblance to modern Persian and Moghul patterns.

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PATTERN PIECES FROM THE MADRAS MUSEUM. See Plate 22.

SHAMVAS KHANY.—A pattern wel known on the Coast and at Wanangal. Weavers say it was first made for one of the earlier Golconda kings.
GOPALA RAO KHANY.—Bears some resemblance to the old diapered "Tree of life" patterns of Lahore and Persia.

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PATTERN PIECES FROM THE MADRAS MUSEUM. See Plate 22.

a. PERSIAN PATTERN.—Resembles many well known Jaipur, Lahore and Persian designs. Claimed by the weavers as one of the very oldest designs they know.

b. PINJRA PATTERN.—Originated probably in a "Koneh" design; the branched filling in one of the field is very still and uninteresting.

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Asham Khany.—Has lost much character by weaving in a low grade, and there has been some distortion of the pattern too. Compare with Plate 22.

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Ayyampett silk rug in very coarse weave, from a specimen in the Madras Museum. With the exception of the blues, all the colours are aniline. Has much of the character of the old Zamorin or Malabar carpets

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Another of the innumerable forms of the Aushamkhany design, with a differing arrangement of the leaves, and large conventional flowers, and with a quaint hooked leaf on the isolated rosette near the border. Made by Subbaya and Co., Bangalore City.

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A South Indian pattern, said to have originated at Walajahnagar, but probably a modification of a Warangal design. The border rather suggests Turkish influence. Probably a modern introduction. Made in the Bangalore Central Jail.

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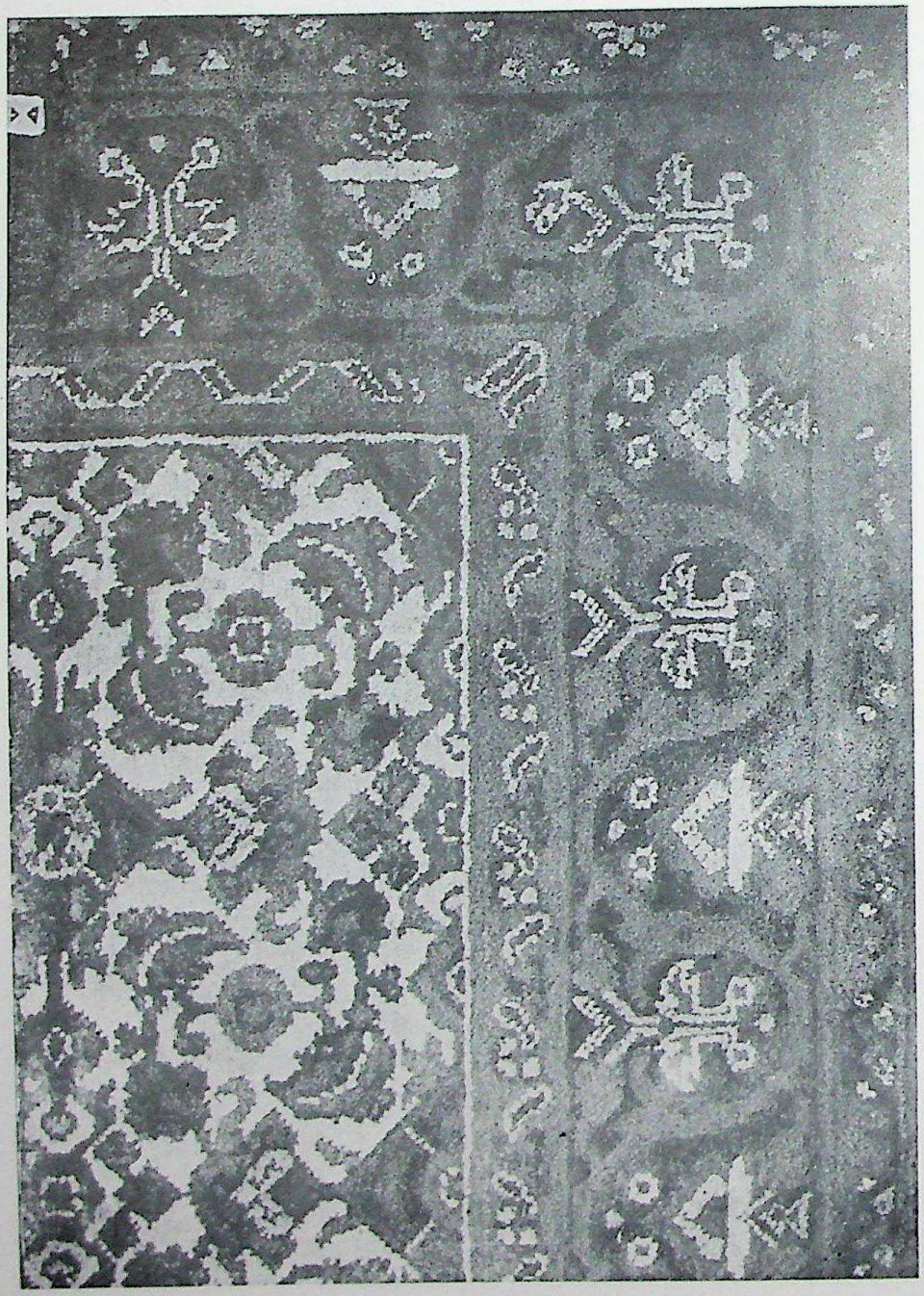

A Persian form of the "Herati" design, XVI. or late XVII. Century. The border is of Moghul character. Comparison of the above with other designs after the Herati manner illustrates well the numerous local influences which have affected this well-known pattern. Made by Messrs. Subbiah Chetty and Co., of Bangalore City.

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Heavy rough silk cloths (Veerali or Veerakali) from the Trivandrum palaces. Usually in crimson and white or creamy yellow; probably used as elephant jhools in Travancore. They are at least 100 years old, and very uncommon. The place of their manufacture is now unknown. The patterning, especially a and b, and the border of c, suggests Persian influence

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C.—Statement showing the Quantity and Value of Dyeing and Tanning Materials imported by Sea from Foreign Countries into the Madras Presidency for a series of years from 1880–81 to 1905–06.

Years.	Alizarine Dyes.		Aniline Dyes.		Cutch.		Gambier.		Indigo.		Myrabolams.		Saffron.		Turmeric.		Other Sorts.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	LBS.	Rs.	LBS. Oz	Rs.	CWT.	Rs.	CWT.	Rs.	CWT.	Rs.	CWT.	Rs.	LBS.	Rs.	CWT.	Rs.	CWT.	Rs.
1880–81 ...	...	...	25,920	6,332	...	...	...	..	..	...	...	...	86	2,613	...	...	1,757	19,750
1890–91 ...	119,299	62,100	Combined with Alizarine.		6	123	42	978	..	...	1,785	4,368	22	883	...	...	1,412	10,021
1895–96 ...	235,292	1,32,318	7,553	6,031	6	192	154	3,270	55 lbs.	12,363	448	1,873	..	...	10	50	864	10,636
1897–98 ...	342,434	1,57,781	9,250	11,768	20	454	190	3,864	2	4	782	3,173	45	1,585	8	84	1,430	21,169
1900–01 ...	1,298,717	5,90,671	100,848	1,25,825	3	68	324	5,758	1	2	1 409	4,426	60	1,615	1 lbs.	27	3,581	60,769
1901–02 ...	755,264	3,81,958	132,442	1,40,587	6	114	304	7,680	55	84	80	279	38	870	19	2	2,381	54,217
1902–03 ...	992,264	5,13,229	141,208	1,48,178	1	19	290	7,421	owt. 265	36,635	2,615	7,675	oz. 2	3	52	4	2,595	45,015
1903–04 ...	1,115,739	5,58,790	155,635	1,50,108	4	82	383	8,896	18	2,969	784	2,224	lbs. 38	1,041	cwt. 18	33	2,955	52,247
1904–05 ...	941,189	4,93,836	148,691	1,40,267	7	147	361	8,016	294	54,321	580	1,595	...	...	lbs. 20	3	2,333	39,261
1905–06 ..	1,121,599	5,44,740	195,530	1,41,829	45	700	394	11,365	91	9,927	3	15	50	720	7	1	3,123	65,374

D.—Statement showing the Trade of the Madras Presidency by Rail in Alizarine and Aniline Dyes with External Blocks from the years 1890–91 to 1906–07.

Years.	Imports.		Exports.		Remarks.
	Quantity.	Value.	Quantity.	Value.	
	INDIAN MDS.	Rs.	INDIAN MDS.	Rs.	
1890–91	254	19,161	43	7,493	
1895–96	735	85,703	303	44,579	
1897–98	2,086	1,14,953	119	10,695	
1900–01	1,867	1,15,868	896	82,827	
1901–02	1,990	1,34,653	59	5,764	
1902–03	3,807	2,33,171	138	12,406	
1903–04	5,731	3,57,642	104	8,822	
1904–05	6,379	3,88,753	262	15,656	
1905–06	6,794	3,88,865	322	19.222	
1906–07	5,965	3,31,087	132	7,333	

* Figures for these years, relate only to aniline dyes.

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APPENDIX.

NOTE BY THE SUPERINTENDENT, SCHOOL OF ARTS, TRIVANDRUM, ON SILK FABRICS IN THE PALACE AT TRIVANDRUM.

There are but few carpets in the palace more than fifty years old, and they are all of foreign, and not of Indian manufacture. The terms Malabar, Zamorin, or Hindu rugs, are not known here either in English or vernacular. Carpets, as a rule, do not appear to have been used in olden days in the palace, but every important room was furnished with grass mats in coloured designs specially made at Kavalaparay in Malabar, which is still famous for the industry. It is doubtful whether the manufacture of carpets, either in wool or silk, was ever an indigenous industry in Malabar. It is almost certain that, in Travancore or Cochin, carpets were never made before. Sir George Birdwood (Industrial Arts of India) does not specify the place, nor does he mention the period during which the industry flourished in Malabar. The terms "carpets" and "rugs" seem to be often applied to other fabrics which are made and used for spreading on the floor.

The above facts induced me to search every old and valuable fabric available in the palace, and a few very old specimens of silken stuff were found. The silks are generally 6 to 7 yards long by 1½ yard broad, and appear to be more than a hundred years ago. They are called veera-kali, veera-vali, and veerali silks. The name veera-kali is locally explained by these fabrics having been greatly used in the pagodas of the goddess Káli, veera meaning rough or ferocious. This interpretation appears to be rather far-fetched. The silks were certainly used in the palaces, and in conferring certain local honours, it was the custom for the Maharajahs to present a silk of this variety, either to tie round the head like a turban, or to spread on an elephant's back for a procession. They are made of very rough silk, which does not even compare in its gloss with coarse tasar silk. Veerali thus might mean rough or coarse worm or beetle, and may have been the original name by which it was at first known, the change into veera-kali being an ingenious mistake. The patterns show that the artisans must have taken much trouble in the weaving process. The fabrics are not only pretty, but also costly. Each of the silks photographed is worth more than Rs. 150. There is a belief prevailing in this country that the silk, charred or otherwise, is a valuable medicine for several diseases, and that other silks are not so, and consequently its value is high in spite of the deficiency in gloss and texture. These silks are now very rare in the palace, and hardly found in the possession of private individuals. They are somehow in great demand in the country for various religious ceremonials even at the present day, but, owing to their scarcity, common silks are substituted for them.

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The Stone Carving Industry.

INTRODUCTORY.

FROM the earliest historical times, stone-carving has held a high position throughout the Madras Presidency. Almost every ancient village has at least one or more temples, on which the skill of the sculptors and carvers was lavished. Numerous examples of their work remain in more or less perfect condition to the present day.

Early stone-carving reached a high degree of perfection, first under the Buddhists in India, a few centuries after the Christian era, and even some time before it.

Probably, the best known examples of this period in Southern India are the Amarāvati marbles, in which chaste floral ornament is combined with a wonderful skill in sculpture, showing a decided Grecian influence derived from the north.

There are, however, in the Kistna district, other mounds, containing remains of *stūpas*, which I have excavated, and where I found sculptures, fully equalling those of Amarāvati.

An example, earlier even than these, is the rock-cut edict of Aśōka at Jaugāda in the Ganjám district. It is however only an example of stone cutting, not sculpture.

"To the Buddhists, we owe the introduction, not only of stone architecture into India, but of a class of sculpture that in parts partook of and rivalled the life-like representations of the Greeks. Sculpture was employed to an enormous extent in the embellishment of their temples; the most perfect examples seem to have been literally covered with it from base to summit. Floral carving occupied a subsidiary place; and is used as a setting to the sculptured panels, or to enrich the details of architecture.

"With the expulsion of the Buddhists, there passed away a mastery of the sculptural arts, which, in India, has never since been equalled. Sculptured groups represented the human figure true to nature, with none of the grotesque, distorted forms so freely adopted in the later works of the Hindus. The more antique ornament never asserts itself, but is always in subordination, and acts as an accessory to the feature to which it is applied. Some of the florid ornament of the later styles is often applied contrary to its constructive use. On the other hand, though the later carved ornament of the Dravidians does not lack in beauty, it differs as much from the Buddhist as does the Roman from the Greek.

"Early South Indian Buddhist sculpture is of a severely quaint character, and is generally in basso, while the later works, with their spirited life-like scenes, are in mezzo-relievo; the carved ornament of both periods is invariably in the former. The raised surface of the objects carved, is as flat as possible, with the edges only rounded off. This style of ornament, with its soft light and shade, does not detract from the solidity of any constructive object, to which it is applied. The favourite floral representations are taken from the leaves, flowers, and buds of the sacred lotus. The flower readily lends itself to an infinity of varied grouping in the hands of a skilful carver. This, and the delicacy of treatment possible with the fine-grained material used, have been fully taken advantage of. The design is occasionally strictly conventional; though, in some examples, a free natural treatment, or a combination of the two is adopted. Other flowers than the lotus are often employed; and the incorporation of floral designs with different animals, grotesque and otherwise, always exhibits a strikingly artistic design with faultless execution." (Rea. "South Indian Buddhist Antiquities," pages 47 and 48.)

Following the Buddhists, each successive Hindu dynasty left examples of their particular styles. The Pallavas cut the celebrated monolithic remains at Māmallāpuram, and the equally artistic structural works at Kāñchīpuram, besides numerous other caves in various parts of the Presidency.

The Chōḷas have left their mark in temples all over the country, their most well-known work being the Tanjore temple.

The Chālukyas erected many exquisite examples in parts of the Bellary district. "No one who has examined any single specimen of Chālukyan carving can have failed to note its marvellous intricacy and artistic finish in even the minutest details. The workman was no doubt greatly assisted by the pliability of the

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material in which he had to work; but his complete mastery of the art is none the less remarkable. On the temple of Guduk, Colonel Meadows Taylor makes some remarks which have quite as appropriate an application here. He states, 'It is impossible to describe the exquisite finish of the pillars of the interior of this temple, which are of black hornblende, or green stone, nor to estimate how they were completed in their present condition without they were turned in a lathe, yet there can be little doubt that these pillars, which support the roof and body of the temple, were in fact set up originally as rough masses of rock, and afterwards carved into their present forms.' The latter statement is true as regards the carving, not only on the piers but elsewhere. There seems, however, abundant evidence to show that the piers were not set up in a rough unmoulded form, but actually turned in a primitive though effective kind of lathe. Of the carving, he writes, 'the carving on some of the pillars and of the lintels and architraves of the doors is quite beyond description. No chased work in gold or silver could possibly be finer, and the patterns to this day, are copied by goldsmiths, who take casts and moulds from them, but fail in representing the sharpness and finish of the original. By what tools, this very hard, tough stone could have been wrought and polished as it is, is not at all intelligible at the present day; nor indeed from whence the large blocks of green stone were brought; and in popular estimation nothing short of the miraculous creation of these temples, of which there are many legends, suffices to account for them.'

"The ornament is generally completely undercut, and sometimes attached to the solid masonry by the most slender of stalks. It has often the effect of an incrustation of foliage placed on the wall. Its general principle seems to have been based on a broad mass of foliage standing in high relief from a narrow but deeply cut background.

"The toning effects of age, which, leaving the details as sharp as when they left the sculptor's hands, have imbued them with their varying shades of brown, and given them added beauty." (Rea. "Chālukyan Architecture," pages 4 and 5.)

Towards the end of the Hindu period, the Vijayanagar kings were the greatest patrons of stone-carving, the most of it being in temples, which exist throughout the whole length of the Presidency.

The Pāndyans and Nāyaks have erected noteworthy examples in the south, but after them, came decadence, or an almost complete cessation of the art, so far as it had existed in former times.

The ancient monuments of South India exemplify the excellence of the sculptors, and the encouragement given to the arts by its sovereigns and others of lesser note. This work is chiefly seen in the temples and their accessory buildings; but also in palaces or tombs, though, in the south, these latter buildings are invariably much less important than the former. The workmen, in former times, were rewarded with lavish gifts of money or lands, as numerous inscriptions testify. This accounts for the excellence of the work produced. It was then confined to a certain caste, whose duty it was to study the *śāstras*, connected therewith, and carry out their work accordingly. Another explanation of the general decay in industries is given by the Abbé Dubois, who states that "perfection in arts and manufactures would undoubtedly have been attained by so industrious a people as the Hindus, if . . . . . the cupidity of their rulers had not acted as a check. As a matter of fact, no sooner has an artizan gained the reputation of excelling in his craft than he is at once carried off by order of the sovereign, taken to the palace, and there confined for the rest of his life, forced to toil without remission and with little or no reward." ("Hindu manners, customs and ceremonies," page 34.) Dubois, of course, speaks only of his own times (1792 to 1823). It must have been much different in earlier historical periods: but what he has stated must have acted as a contributory cause to the decadence which followed. Probably, a great deal of forced labour was formerly employed in the construction of the great historical monuments, with which India is covered. This was the case in Egypt, and was doubtless so in India.

At the present time, a general decadence of the stone carver's art is observable: economy is the ruling feature, and in places removed from large towns, there is no work to keep carvers regularly employed. Thus, those who still practise it, do so in combination with some other trade; or they flock to the larger towns, where more work of their particular kind is to be had. Even in these larger towns, it is unusual to find any modern building, constructed entirely of stone. Brick is the material used, and it is only in such features as panels, bases, capitals, carved balconies and the like, that stone carving is employed. Even in such connection, terracotta is often used in place of stone.

In tombstone work in large cities, some numbers find employment.

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Utilitarian buildings, such as railway stations, bridges, hospitals and offices, do not, as a rule receive much attention from the stone carver. Some carvers have, within late years, been largely employed in the renovation of some of the larger South Indian temples, and the class of work there produced, shows that the skill of the Indian craftsman is not yet finally extinct, but only requires encouragement. A fine example of all classes of work is the new palace, now being erected at Mysore. Places where works of less importance are being carried out, are at Tadpatri, Trichendūr, Karūr, Śvāmimalai, Chidambaram and at Pennni near Arkonam.

Though stone carving, in its various branches, comprising the useful and the artistic, may have retrograded from the high position it occupied in Madras centuries ago, it will be seen from the particulars recorded in this monograph, received from all parts of the Presidency, that it is still pursued in a few centres. To these places, application is made for artizans, when work is required to be done in other places. Dealers also, in such large towns as Madras, get their articles for sale from these places, and sell them without the purchasers probably knowing from whence the articles come.

This is characteristic of most of the other decaying industries of Madras. The centres are well known within a few miles of them; but further off, they are not known at all. One of the chief objects of such monographs should be to make this knowledge more widespread, and so procure increased patronage for the artizans.

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The Stone Carving Industry.

CASTES WHO ENGAGE IN STONE CARVING.

THE history of artificers in general, is said to have originated with *Viśvakarma*, who had five sons, *Manu*, *Maya*, *Śilpa*, *Tvashtra* and *Daivagña*. These five sons were the originators of the five crafts, which their descendants severally follow. Accordingly, some engage in smithy work, and are called *Manus;* others in their turn, devote their attention to carpentry. These are named *Mayas*. Others again, who take up stone carving, are known as *Śilpis*. Those who do brass and metal work are *Tvashtras*; and those who engage in making jewellery are known as *Visvagñas* or *Daivagñas*. These are not caste distinctions, but are based upon the profession taken up. The five sub-sects named above are said to interdine and intermarry with one another in the Ceded Districts, though the custom is not generally prevalent in the Tamil Districts. In point of social status, they take rank as classified above; *i.e.*, the first is supposed to be socially higher than the second, and the second higher than the third, and so on. The legend connected with the origin of this caste is as follows:—At the beginning of the creation, *Brahma*, who had five sons (*Pañchānana*) originated the above five sub-sects, one from each face. These sub-sects claim the *Vēdas* for their scriptures. All the five sub-sects wear the sacred thread, *Yagñōpavītam* (यज्ञोपवीतं) and trace their descent from *Viśvakarma*—the *Brahma*. They very often assert their claim to be regarded as 'Brahmins' (twice born) and do not invoke the aid of Brahmin priests for performing their ceremonial rites. As we are at present concerned only with the third sect (the *Śilpis* or stone masons), it may perhaps be sufficient to furnish a few more ethnological details regarding this class only. The *Śilpis* mention their *Gōtram* (गोत्रं)—lineage or stock of family—as *Pratnasa Gōtram* (प्रत्नसगोत्रं)—and own the *Adharvana Śākha* (अथर्वणशाख), *Koupyāyana Sūtram* (कौप्यायनसूत्रं)—institute or creed of *Koupyāyana*—, and *Aghōrapravaram* (अघोरप्रवरं)—one of the family race of lineage. They are found in fair numbers in many villages of the Ceded Districts, and are vegetarians in diet. They are also expected to abstain altogether from alcoholic drinks, but the drinking habit is finding favour with many of its adherents, though when detected, the person addicted to it suffers social degradation. The thread investiture ceremony is also in vogue amongst them; and like the Brahmins, they marry their girls before puberty. Widows are not allowed to remarry. They bury their dead. The institution called the '*Srādha* (श्राद्ध) ceremony' (propitiating deceased ancestors) is also in vogue amongst them. As regards their faith, they profess the religion known as popular Hinduism. The deity worshipped by this class is called *Kāli*, the incarnation of *Pārvati*, wife of *Śiva*. They believe in the existence of devils; and occasionally worship serpents. They read in their home circles, the *Śiva purāṇams*, such as the '*Skandapurāṇam*' and have their own *Guru* (priest). Several of this class are literate, and their mother tongue is Telugu, excepting the few in the Tamil Districts.

Now-a-days, sculptured work is not confined to one particular class, as in ancient days, but members of all castes, have, either from choice, or necessity for a living, adopted the profession. Thus, there are now different castes or races of people, such as blacksmiths, carpenters, goldsmiths, weavers, *Agamadiars*, *Ambalagārs*, *Anakalas*, *Bōjas*, *Dombars* (acrobats), *Edayars* (cowherds), *Jangamandis* or *Kallandis*, *Jeenigars*, *Kalluguttigars*, *Kavarais*, *Maravas*, *Muhammadans*, *Naiks*, *Padayachis*, *Pallars*, *Shanars*, *Sholia Vellalars*, *Sudras*, *Tota Baligas*, *Valayars*, *Vāniyas* (oil mongers), *Villambars* and others who engage in this work. There are also other skilled stone carvers in various parts of the Presidency.

CLASSES OF WORK EXECUTED.

A small amount of carving, such as the *Padmam* (पद्मं), *Alankarajagati* (அலங்காரஜகதி), *Kumudakam* (குமுதகம்), *Patṭiyal* (பட்டியல்) *Kāpvari Kalaśam* (கபவரிகலசம்) and *Palagai Bōdiyal** (பலகைபோதியல்), is generally found in all the innermost shrines of temples. Besides these, images and panels are cut out of stone, such as *Jaya Vijayas*, *Gaja Lakshmi*, door keepers of *Śri Vishṇu*, parrots, monkeys, elephants, horses, snakes and various other figures and architectural details. All the carved or sculptural ornaments, necessary in temples, can still find artificers in a few scattered places skilled in producing them.

* These names indicate flowers, such as the lotus, and geometrical figure drawings and other kinds of ornamental carvings.

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In addition to this architectural carved work, others engage themselves in producing small images, domestic utensils, paper weights, rulers, ink-stands, ink-bottles, penholders, bangles, rings, *Kuṭṭuma Bharaṇee*, *Kātika Kāyee** and other small toys. These are made of granite, or black and white stone. One of the most interesting classes of work turned out is pebble spectacles and images, made of crystal, at Settipalayam, Coimbatore district. People can also purchase at Madras and other places, uncut rubies, and get them cut according to the requirements, for making jewels, etc. Culinary utensils, such as pots, pans and others are made of soapstone. These are cheap, and, if carefully handled, last for years. The food prepared in these is said to be good. These vessels are also extensively used for preserving pickles. In this connection, it is interesting to note that these stone vessels can be freely handled by anybody without pollution, so long as they are new, and have not been used for any purpose. But, when they are once so used, particularly for cooking, they must not be exposed, even while they are being cleaned, to the sight of lower caste people. They are never thus handed over to them for cleaning purposes. If they are thus seen or handled, they are considered as having been polluted, and are thrown away as unworthy of further usage. The treatment of earthen pots is also similar. Metallic utensils, such as those of brass, copper, lead and iron are allowed to be cleaned by certain inferior castemen. When these are so handled, they are washed with tamarind juice and water which is said to purify the pollution thus caused. Iron vessels are purified by the sprinkling of water mixed with cowdung. In some cases, the sacred grass or *Darbha* (दर्भ) is put into the vessels and burnt therein as a means of purifying. The use of wooden vessels is different from these. They can be handled by anybody, at any stage, the only method of purifying from pollution, being by washing them with water.

STONES OR OTHER MATERIALS USED.

The different kinds of granite or other stone used for sculptural or other purposes are—Black hard granite from Pallavaram, grey soft granite from Sholinghur, Sandal or *Thadā* stones (red);—these are of such a nature as to admit of any kind of detailed carving; they are not usually polished; green soft granite from Kurnool, and Coimbatore stone—buff coloured;—the last one is used for all kinds of work without polish—; Bangalore, Sāraki stone, which is considered to be of superior quality—; and Mysore—Siddalingapuram quarry Porphyry—hard stones.

A common and extensive use of the *Thadā* stone, that has been made by Hindus, throughout the whole of India, is its utilization as a grinder for the reduction of sandal paste from sandal wood. The surface of the stone is naturally rough, and when sandal is mixed with water, and the grinder used, a paste is readily formed. The sandal paste, produced by the use of this stone in the manner described, is, and has been for an indefinite period used for ceremonials in connection with the worship of images, both in private households and in the public worship of temples.

Marble and other coloured stones are also used in making crosses in tombs. There are three kinds of these—Statuary marble (superior and pure white). It is soft and will give a fine polish. It is used chiefly for works within public buildings and churches. Cararra marble—veined (less superior and white);—this is used for in-door, as well as for out-door work; and Sicillian veined marble (inferior and white),—used for all kinds of work.

Micacious schists are also used in making small images or toys.

A peculiar kind of stone called *Kuruvindam* (ಕುರುವಿಂದಂ) is used in polishing.†

Besides these, several other kinds of stone brought from various districts are also used.

TOOLS OR IMPLEMENTS EMPLOYED.

(Plates II and III.)

The tools or implements used, are made of various shapes and sizes to suit requirements. A single tool is sometimes pointed and shaped in different ways to work out the finer details. The chief and most indispensable one among them is the chisel, which is made of well tempered steel, from half an inch to an inch and a half in diameter, and from three to nine inches long, and octagonal, square or round in section, with points to suit the nature of the work required to be done (Plate III, Figures 13 and 16).

The first tool is the *Koṭṭalān* (ಕೊಟ್ಟಲಾನ್). This is used for cutting a large block of stone into smaller pieces. This weighs about 60 *palams*‡ or 4$\frac{1}{16}$ pounds. (Plate III, Figures 18 and 19.) When the stone is

* Explained on page 7. † *Vide* page 4. ‡ *A palam* weighs three tolas.

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roughly hewn with the *Kottalān*, different sizes of hammers, weighing 4, 3, 2, 1½ and 1 lb. each, are used with chisels. (Plate II, Figure 3, Nos. 1 and 2, and Plate III, Figures 27, 28 and 36.) The chisels have different names, viz., *Vettumunai Uli* (வெட்டுமுனை உளி), *Taraivettumunai Uli* (தரைவெட்டுமுனை உளி), *Taraipattu Uli* (தரைப்பட்டு உளி), *Koochu Uli* (கூச்சு உளி), *Taraikoochu Uli* (தரைகூச்சு உளி) and *Palamunai Uli* (பலமுனை உளி)—Plate II, Figure 3, Nos. 4 to 15, and Plate III, Figures 12 to 26 and 34 and 35. Of the last mentioned implement, *i.e.*, *Palamunai Uli* (பலமுனை உளி)—with small points like the skin of a jack fruit—there are several of different sizes, made to suit the cavities they are to cut, according as these are large or small (Plate II, Figure 3, No. 15). These are called *Perumpallupalamunai* (பெரும்பல்லுபலமுனை)—chisels with large points—*Nadurāsippallupalamunai* (நடுராசிப் பல்லுபலமுனை) medium points—*Sannappallupalamunai* (சன்னப்பல்லுபலமுனை) fine points, and *Kambarisippallupalamunai* (கம்பரிசிப்பல்லுபலமுனை) numerous points, each being as small as the grain called '*Cambu*' (கம்பு).

The next implement used is the *Arapasanam* (அரபாசனம்). With this, the stone worked with the *Palamunai* (பலமுனை) is scraped, after previously wetting the stone with gingelly oil. Then comes filing. There are four kinds of tool for use at different stages from rough to smooth. There are two other chisels, named *Kandadvāra Uli* (கண்டத்வார உளி) or *Vajrāyudam* (வஜ்ராயுதம்) and *Thēraroyam* (தேரராயம்). These are only used in carving images. The former is used in making fine holes, and the latter to work in cavities, that cannot be reached by other tools. These are bent or curved in the points, body, head and so on, to suit the nature of the work required. These are the kinds of tools and implements used, but they are known by different names in different localities. Generally, the short triangular edged tools are used for rough work, and the longer or more slender ones, for fine workmanship.

METHODS OF WORKING.

(Plates I and II.)

The workers are first given drawings or models to work from. To make idols, blocks of the required size are selected, cut to the necessary lengths, and dressed by chisels of large size. These are used exclusively for dressing and rough outlining only. They are made of hard steel, and are frequently tempered in a forge. The stones are then cut into certain definite lengths for the different sorts of idols according to *slōkas* (verses on the subject). For *Durga* idols, the technical phraseology for the measurement is the rule of ten proportions, *i.e.*, the whole length is divided into ten portions for the length of the several sections of the body. Smaller lengths are determined by length of *yanams* (a particular grain found on the banks of the Indus, and resembling paddy). The size of the eyes, eye-brows, nose, fingers, etc., is determined by *yanam* lengths. For idols of *Vishnu* or *Subramanyam*, by the rule of nine proportions; for *Badrakalis*, by the rule of eight proportions; and for *Ganapathi*, by the rule of five proportions. The pedestals should be as high as the images thereon. After the outlining is over, the form is cut out with a fine chisel. It is then smeared with sweet oil (*sesamum*) and kept for a day. The oil renders the surface of the stone soft, and prevents it from flaking off, or the breakage of the projecting parts. Every time a surface has been smoothened, the application of the oil should be repeated. In carving out the details, human breast milk is, in some cases, smeared over the stone with a cloth, and the final touches then given.

The method of carving, in general, includes various stages. A block of stone, intended for a work, is first cleared of its superfluous parts, by means of an iron steel implement, known as *Vettu Munai Uli* (வெட்டுமுனை உளி) which is thick, and from six to ten inches long, with a blunt point. This is placed on the stone and hammered by the *Suttial* (சுத்தியல்)—hammer of four *rathal* * (ரத்தல்) weight. In the second stage, the stone is finely dressed. Thereon, the figures, intended to be carved, are drawn on the stone with a pencil, or by means of a piece of bamboo, dipped in a coloured mixture. In the third stage, the figures are roughly cut with chisels, and worked up gradually, till the required shape or form is arrived at. In the fourth stage, they are still further defined; in the fifth, the rough surfaces of the back ground, and the roughly cut out image are cleared; and in the sixth, they are polished or smoothened. The second stage improves the first, the third, the second, the fourth clears the surface, the fifth levels or planes the rough surface, and the sixth polishes. These several stages, in succession, tend to make the sculptured portions finer and finer, the last of these being polishing.

* A *rathal* weighs a pound or about 39 tolas.

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POLISHING.

For this purpose, the materials required, are made as follows :—

Steel is hammered into fine flat sheets and steeped in water. With the perfecting of this process, depends the success in making it into a fine dust or powder, which is done by grinding it under an iron pestle and mortar. The powder got by this process, is divided into four or five classes, from rough to delicate powder. This powder is then placed one after the other, in order, from rough to fine, over the surface, required to be polished, and rubbed over it with water. Smooth flat surfaces are effected by rubbing with stones made specially for the purpose; and uneven surfaces, by steel implements of several varieties, of different sizes, to pass into corners or crevices.

Thereon, a special kind of stone, known as *Kuruvinda Rayee* * is reduced to powder, and divided into different classes according to their size and fineness. Each of these is mixed with very fine sealing wax (*avalarakku*), such as is generally used in filling up the hollows of jewels, in proportion to the nicety required. Usually, two parts of the powder are mixed with one part of the wax. The mixed matter is then placed over fire in a vessel, and melted to a certain degree. This is tested by letting a drop of it fall on the ground, and if when it gets dry, it is reduced to powder, immediately, by a stroke of the hammer, it is supposed to have been tempered to the required degree. When this stage is reached, the mixture is taken out and flattened into a plate by beating it with a *Sammattee* (சம்மட்டி)—a kind of axe—or by rolling with a pestle. It is then taken out, and cut into slices of square, oblong, triangular or other shapes. These become as hard as stone. With these blocks, the surface of the stone, already polished, as above said, is again rubbed over with water. When the colour of the sculpture or carving is required to be black, at least a fourth is accomplished, by rubbing the portions with the steel powder, and the final blackening is attained by rubbing it with *kuruvindam* stone. The next process is *Urukku Sāṇai* (உருக்குசாணை) or filing. This consists in rubbing the stone with square brick-shaped leaden plates. This process renders the surface smooth and glossy, so as to reflect anything that is set before it. Above all these, there is said to be another process which is only done at Woriur near Trichinopoly. It is said that the workers besmear the stone prepared as above, with the juice of certain herbs during night. In the morning, it is rubbed smooth, and the result is a polish as smooth as glass. In the case of an image, the implements, known as the *Uḷi* or chisel, are more in number, according as the work is outlined in flat or irregular surfaces. These chisels are made of steel, and are hammered on the stone in rough work and more gently with finer implements for the more finished work. The work is finally given a finish with *kuruvindam* stone, if polish of a high order is desired.

TEMPERING OF EDGED TOOLS.

A peculiar and simple kind of furnace (*vide* Plate III, Figure 7), constructed of a few burnt bricks in mud, is generally used for tempering edged tools. The tapering end of the tool is placed at the mouth of the furnace, the body, leaning on the sloping surface. When it is well heated, it is taken out and hammered, until the end gets sharply pointed. When it is half cooled, it is dipped in cold water and then used. In this process, water is continually poured, in order to temper the tool, and soften the stone.

SILATANKAM.†

To preserve sculptures or inscriptions, and also to restore or re-form the mutilated portions of images, or to give a stone sculptural appearance to earthenware, and secure its durability, the earthen or mortar work is coated with a composition, which serves the intended purpose. This mixture is made like that of the *kuruvindam* stone. Wax, benjamin (white) or frankincense, and brittle honey-wax (available in Bellary, and other places, purposely made, so as to be brittle), are mixed with powder of that species of stone, which requires retouching. All these materials are heated and examined, and if they have reached the required degree of melting, which is found by testing it on other objects, it must immediately be used.

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* The correct spelling of this word may be *kuruvandam*, Sanskrit *kuru* plus *andam*, meaning to make beauty, *i.e.*, by polishing.

† Literally meaning a mason's chisel. It, however, here refers to a composition used for repairing damaged sculptures or carvings, or the covering of the surface of any soft material, so as to give the latter the appearance of stone.

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SPECTACLES.

In making spectacles and small idols, such as the *lingam* and *Vināyakā*, of crystal, the following method is adopted :—

The rough crystal is first dipped in gingelly oil, and dried in the sun for a few hours ; it is then taken up, and by a small chisel, the rough portions of the stone are made smooth. The stone is then shaped, by being rubbed on a grinding stone, for a day or two, with *kuruvindam* powder and water. It is then attached to a wooden bar, and cut into two or three pieces by means of a saw. The pieces so split up, are again rubbed on a smooth grinding stone made of *Vengakkal* or *Vengachaṅkal* (வெங்கச்சங்கல்)—a kind of stone—and rendered thin or smooth to the touch. The pieces are then taken to a hand-mill, to which a circular plate, made of mango wood is attached. They are polished by placing them in contact with the plate, while it is kept rolling. The pieces are finally rubbed on a flat piece of wood made of *Erukkankaṭṭai*—the gigantic swallow-wort (Asclepias). This completes the process. In all the above stages, *kuruvindam* powder, varying in fineness is used to facilitate the work.

LINGAM AND VINĀYĀKA IMAGES, ETC.

(PLATE XX, FIGURES 1 AND 2.)

The rough stone or crystal is, as in the above instance, chiselled, and then taken to a hand-mill, called in Tamil *Sāṇai* (சாணை)—whet-stone or hone—to which is attached a circular plate, as hard as iron, made of *kuruvindam* powder mixed with the sealing wax—*arakku* (அரக்கு) used by smiths. This is the first step taken in reducing the stone to its required shape. It is then applied to three other *sāṇais*, each successive one, being finer than the preceding ones ; the first shapes the stone, the second describes the lines required on the margin, etc., and the third polishes the idol. Finally, it is taken to the mill, made of the plate of mango wood, just as the spectacles are, as before noted. *Kuruvindam* powder is used throughout, and it is said, it takes eight to ten days to make a *lingam* or *Vināyakā* about three inches long. These are sold for three or four rupees on an average according to workmanship.

For shaping uneven red stones, such as uncut rubies, for use in jewels, etc., the work is done as follows :—The uneven red stone is attached to a stick, containing sealing wax at one end, and is applied to the *sāṇai*, and ground flat. It is then taken to two other *sāṇais*, with disc shaped pieces of lead and copper attached to them ; the first makes the part slightly hollow, and the second polishes it. Afterwards, the other side of the stone is shaped and polished by being applied to the *sāṇai*, made of *kurvindam* and wax ; and nextly to another *sāṇai* containing a copper plate. It is stated that the work takes a good deal of time, over a week in some cases. The value of the stones depends on their quality and brilliancy. A collection of twenty stones is known as *koḍigai* (கொடிகை) and is generally sold from ten to thirty rupees.

The precious stones used in jewellery are the *navaratnās*,—the nine gems,—*Gōmédhakam* (the agate), *Mānikkam* (a ruby), *Marakatham* (an emerald), *Nīlam* (a sapphire), *Pavaḷam* (a coral), *Pushparāgam* (a topaz), *Thāraḷam* (a pearl), *Vaidūryam* (a gem of a dark colour), (*Lapislazuli*) and *Vairam* (a diamond). Other artificial stones used in this work are obtained from Pondicherry.

There are three methods of setting these in jewellery—(1) inlaying in gold, called *kundanam* settings, (2) setting stones in gold or silver cells and filing down the edges to fix the stone in place, called *kaṭṭadam*, (3) boring a hole in a thick piece of gold or silver and fixing the stone in it by the application of great pressure, what is called *tapadam*. The second and third of these are usually done by all goldsmiths, while the first can only be executed by some smiths, specially trained in the art. Plate II, Figure 2, shows how the first method is carried out. It will be seen that the apparatus required for the purpose consists of two grinding stones, two steel *pōgaraḷu* (పోగరాళు)—chisels—two small files, one pair of pliers and one glazing stone, fixed to the end of a piece of wood. The gold is heated or refined to the required highest degree, and beaten into the thinnest plates. These are then rolled, and kept in a paper box, lest they should be blown on by wind. When any jewel studded with precious stones, is to be prepared, the principal part of the jewel, or the receptacle in which the stones are to be set, is first made in gold or silver. This gold jewel or the receptacle, is fixed by wax to the end of a stick of six or seven inches in length. The cells are first inlaid with a foil of the corresponding colour (*varti-rēku*—వర్తిరేకు) to increase the lustre of the stone. The stones are then set therein. The thin gold leaf is then spread by means of a plier round the edges of the stones, and repeatedly pressed with the chisel till the gold is firmly

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fixed to the edges of the stones. The process is continued till the required thickness is reached. When this is done, it is finished by cutting it to the desired shape, and by being rubbed with burnishing stone. For making seals (Plate XX, Figures 3 to 6), the pieces of stone are shaped on a whetting stone, and then the surface is made smooth. Subsequently, letters, etc., are carved on them by means of steel chisels.

EXAMPLES OF WORK AND OTHER PARTICULARS ON THE STONE INDUSTRY IN THE SEVERAL DISTRICTS OF THE PRESIDENCY.

GANJÁM.—The temple, in Berhampore, dedicated to the goddess *Kanyakāparamēśvari*, was constructed two years ago. Another is in course of completion in the village of Pālyama, situated at a distance of about seven miles from Purushotapur. The carvers employed at these temples are natives of Motura in the Atagada zamindari, Purushotapur division.

VIZAGAPATAM.—There are no professional stone carvers or inlayers in this district. Carving work is done by *Kamsalis* (smiths), *Telagās*, *Kapūs*, *Reddikis* and *Gollās*. These carvers are residents of Vizianagaram, Bobbili and Sitarampuram. A kind of sand stone, brought from Bhuvanesvaram, near Puri, is used for the work. A fountain, now being constructed on the eastern side of the Pedda tank at Vizianagaram, contains good carvings. In Waltair, and within the grounds of his bungalow, the Raja of Kuruppam is erecting a small temple over the tomb of his wife, commemorating her memory. The temple has an octagonal shaped *mandapam* attached to it in front. The Raja is trying to get the best class of work, and has brought sculptors from Kolhapur in the Bombay Presidency. The sculptures and carvings are neatly executed in white sand stone. Illustrations of some of these are Plate IV, Figures 2, 4 and 5; Plate V, Figure 2; Plate VI, Figure 1; Plate IX, Figure 1; Plate X, Figure 1; and Plate XIX, Figures 4 to 9.

GÓDÁVARI, *Amalapuram Taluk*.—The Deputy Tahsildar of Kothapeta has furnished particulars regarding the preparation of jewels, set with stones; this has been fully dwelt with under the heading, 'Methods of working.' Plate II, Figure 2, illustrates this kind of work. Figure 1, in the same plate, shows the method of cutting a stone mortar by a mason there.

Ramachandrapuram Taluk.—Rapaka Virabrahman of Venkatayapolem, a sculptor here, is a goldsmith by caste. The work executed by him is said to be of a high order. He has a knowledge of the *Silpi Sastra i.e.*, science of sculpture, etc., composed by *Manu*, and does work in accordance with its precepts. Examples of his work are—

A temple and *mandapam*, constructed at a cost of about Rs. 20,000 at Annavaram in the Peddapur taluk, having images of the Sun, *Pārvati* (wife of *Śiva*), *Vishṇu*, *Gānēsa* and a *Lingam* with *pāṇivattam*; a temple at Bendapudi in Tuni division, constructed at a cost of about five or six thousand rupees; a two storeyed *mandapam*, around the shrine of the Śiva temple at Draksharama; and a temple and *mandapam* at Somesvaram, Ramachandrapuram taluk, built at a cost of about Rs. 20,000 and 5,000, respectively.

Other examples of his work are—

A *Nandi* (Sacred Bull) in Hamsavanam, Tuni division; a Snake (*Subramanyēsvarasvāmi*) at Cocanada; an image of *Śrī Krishṇa* with his consorts *Rādha* and *Rukmaṇi*, in Tipparu; and *Āñjanēyar* (Monkey god) at Kandavalli, Tanuku taluk.

Rajahmundry Taluk.—The sculptors here, are *Kamsalis* and *Muhammadans*. A species of hard black stone available here, is used for carving. Examples of the work of these sculptors exist at Rajahmundry, Jegurupadu, Kolamu and Kateru in this taluk. The *Muhammadans* of Kateru are capable of making, from this black stone, various articles for domestic use, such as *Tiragalāde* (తిరగలాడె)—a grinder or grinding stone—*Rubburōllu* (రుబ్బురోళ్ళు) —a mortar for grinding—*Sannikallu* (సన్నికల్లు) —grinding stone—and *Kalavams* (కలవము).

KRISHNA.—*Kamsalis* are generally the only professional stone carvers here. Others are, a son of a dancing girl, and a Kondapalle toy maker. There are only a limited number of quarries which supply stones suited for carving. Near Jaggayapet, there are some quarries where *napa* (white marble) of good texture is available. But, the bulk of the stones are purchased from the neighbouring Nizam's quarry at Kuchupadi. The latter is a greenish grey sandstone spotted with black, and deteriorated by an admixture of particles of quartz. Examples of the work, executed in recent years, are at Jaggayapet and Bezwada. The works at Jaggayapet were executed by the son of the dancing girl, one of which is the figure of an *Āñjanēya*. This sculptor is said to be now engaged in preparing a statue of His Majesty, Edward VII.

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GUNTÚR.—The stone sculptors of various castes, in the district, are goldsmiths, blacksmiths, *Sūdras* and *Muhammadans.*

Vinukonda Taluk.—Some curious toys of the following description, are made in the village of Koppakonda, from a peculiar kind of stone obtainable from the quarries in the villages adjacent to the rivulet Gundlakamma :—Chess pieces, *kuṅkuma Bharanee* (ಕುಂಕುಮಭರಣಿ) — a small cup with a lid for keeping *kuṅkumam* or coloured powder, used by native ladies to adorn their foreheads—*Kātika kāya* (ಕಾಡಿಗೆಕಾಯಿ) — a still smaller cup, with lid, for keeping what is called eye-dye (collyrium ?)—a special preparation, with which native ladies adorn their eyelids—and oval shaped snuff boxes (Plate XIX, Figures 12, 13 and 18, and Plate XX, Figures 7 and 8). Plate XIX, Figures 12, 13 and 18 are made of black stone, well executed and highly finished. The first two have some floral carving inside, which shows the delicacy of work, the sculptors are able to produce.

Plate XX, Figures 7 and 8, are chess pieces, for two opposing sets, finely executed and choice specimens of finished work in black and gray stone. These show the arrangement, with which Hindus set the game. As this is different from the European method, the arrangement may be noted and the names given. In the middle, are placed the king and minister, then the horse, camel and elephant, one on each side. In front of these, are the eight *pedas* (infantry or foot soldiers, c.p., *pedis*—a foot). The opposite set also, is similarly arranged.

KURNOOL, *Cumbam Taluk.*—Fine carvings, executed recently, exist in the villages of Tirumalla, Idamakkal, Gopalanahalli, Mundlapad, Edavalli and Ardhavid of this taluk.

Koilkuntla Taluk.—Examples of modern carving here, are—*Rangasvāmi* temple, with good specimens of stone carving at the gate, notably two female figures, playing on the *Vina*, one on each side of the doorway ; *Narasimmaśvāmi* temple at Kampamalla with scenes from the *Prahlāda Charitram*, carved on the pillars in the front *mandapam* ; *Śiva* temple at Sarvapallee with two ornamented elephants, one, a male, and the other, a female, carved in front of the temple ; Balanasi Reddi's tank, with some fine specimens of stone carving, at Chakarajuvenula ; *Rāmā* and *Íśvara* temples, and a large tank at Dēvaróyapallee, with good carvings ; and *Paṭṭābhirāmaśvāmi* temple at Chakarajuvenula with pillars in the front *mandapam*, beautifully carved. The workmen in the first of these temples are from Idumakkallu and Komaravole (Cumbam taluk). Bala Viranna and others of Gumpramanudinne, executed the works in the other places quoted above.

Markapur Taluk.—The workmen in the taluk, are of several castes, comprising *Jeenigars*, goldsmiths, blacksmiths, carpenters, *Anakalas*, *Toto-baligas* and *Muhammadans.*

Nandyal Taluk.—Vadla Veerayya, of Pedda Devalapuram of this taluk, is the only carver here. He is a carpenter by caste. He follows the written instructions bequeathed him by his father, relating the methods of carving various kinds of idols, images, etc. Examples of his work are: Images of *Pārvati*, *Gaṇapathi*, *Vīrabadrudu* ; two wells and a door frame at Lingapuram, *Pārvati*, *Gaṇapathi*, and a well at Mahānandi of this taluk : and *Pārvati*, *Gaṇapathi*, *Virabadrudu*, *Venkatēśvara*, *Alamēlumanga*, *Śrīdēvi*, *Bhūdēvi* and *Hanumantha* at Nandikotkur.

Pattikonda Taluk.—Carvings exist in the temple at the shrotriem village of Gundala.

Sirvel Taluk.—A temple recently built by the merchants at Govindapallee, contains ordinary carvings of no special merit.

BELLARY, *Harpanahalli Taluk.*—The only class of people that work at the industry here are *Dombars*. They use the soap stones available in the reserved forest near this village, and turn out such articles as pots and pans for domestic use, and other curious and small objects, such as the *Lingam*, *Basuvaṇṇa*, *Hanumantha*, *Gaṇēśa*, ink-stands, etc. Some of these are illustrated in Plate XVIII, Figures 3, 5 and 10, and Plate XIX, Figures 3, 10 and 11. Plate XVIII, Figures 3, 5 and 10 are used in worship along with their idols, by Hindus in their houses. Plate XIX, Figures 10 and 11, are usually used for keeping pickles, curry stuff or such other articles in a small quantity for daily use. Large sized ones of this kind are used in preparing broths, preserving pickles for a considerable time, and in storing ghee, oil and such like. These are wholesome, as any article kept therein does not get corroded, tarnished or covered with verdigris.

Some fine specimens of modern stone carving exist in the temple at Mylar, Hadagalli taluk, and in the recently constructed gateway of the old temple at Kuruvatti. The work was executed by a man of the *Uppār* caste of Madlari village in the Bombay Presidency.

Hospet Taluk.—The only few carvers here are *Lingayits* by caste. They do not confine themselves to this work alone, but engage in weaving, trading and other kinds of work or trade as circumstances may suit. Designs

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for their workmanship in stone, are their own originals. The headman of these workmen has travelled through Bombay, Hyderabad and Mysore, and gained his knowledge of workmanship and design from buildings in these places. The wages of these workmen vary from Re. 1–4–0, 1–0–0 and 0–12–0 to 0–8–0, according to the excellence of the work executed. These men have worked at the temples at Kuruvatti, Mylar and Puram. The temple at the last mentioned place is a very fine one.

The stones used in the construction of the temple at Hospet—at which they have worked for several years,—are from a quarry at Badarchettybunda, about four miles and-a-half from Kamalapuram.

ANANTAPUR, *Hindupur Taluk*.—The stone carvers here are Dasappa of the *Setti Balija* caste, and Kajasahib, a *Muhammadan*. These are neither professional carvers, nor can they execute fine work. They can only cut out rough figures on stone slabs. They have recently built two temples here, dedicated to *Vēnugopalaśvāwi* and *Rāmaśvāmi*, but these contain only ordinary carvings which merit no special mention.

Tadpatri Taluk.—The sculptors here call themselves '*Śilpis*,' and are known in this locality as *Gumpramanudinne* people, after a village of that name in the Sirvel taluk, Kurnool district, of which they are natives. All these are known by the suffix of *Áchari*, after their names, in the Tamil country. These people do not confine themselves to sculpture, but are experts in other arts as well, peculiar to their castes, as *Áchāris*. These people state that their forefathers have been sculptors for at least four generations. Being natives of a village in the Kurnool district, their works were at first confined to that district; but, subsequently, the men of the present and previous generations extended their field of work to the Cuddapah and Anantapur districts. These people are at present engaged in the execution of the very fine sculptures now seen at the new temple of *Kanyakāparamēśvari* in the town of Tadpatri. The carved work in this new temple is, in every respect, design and finished workmanship, fully equal to the carvings on the ancient temple in Tadpatri, so well known through the notice given to them by Fergusson in his *History of Indian and Eastern Architecture*. The *Gharbhālayam* or the inner shrine, which has been almost completed, is built on the following design. There is a substructure or foundation of carved stone, consisting of four stages—The first stage called *Prathamam* (ప్రథమం) is a small square, shaped and chiselled, decorated at intervals, and interspaced with *Kamalams* (lotus flowers). Above these, is a row of *Nāga* hoods. The third is a piece of carved stone, knit together with *Kamalams* at the edges, and *Gummadikaya Varusa* (గుమ్మడికాయవరుస) —rows resembling the upper part of a pumpkin—carved on the surface. The fourth stage consists of *Kabotham* (కపోతం) carved in much the same way as the second stage. The gateway of the inner shrine *Gharbagúdi* (గర్భగుడి) is decorated with stone carving of different patterns, and has ornamental creepers, birds, lions, and elephants (Plate IV, Figure 3, and Plate V, Figure 1). At the doorway, there are two stone pillars, one on each side; above these pillars are four posts. All these are finely worked. Images of *Kanyakāparamēśvari* and *Gaja Lakshmi*, with elephants on either side, are prominently shown (Plate IV, Figure 3, and Plate V, Figure 1). In the front hall is a *mandapam* of four pillars now under construction (Plate X, Figure 3). These pillars are, in shape, like those at the doorway, mentioned above. The base of each pillar is octagonal and bears images of *Ashtadikpālakas* or the lords of the cardinal points and eight elephants (Plate XII, Figure 1). On the top of the base, are placed what are called *Araḍabhoddulu* (అరడాభొద్దులు) on which figures of *Sapta Rishulu* (సప్తఋషులు) — seven saints—, *Simhalalātamulu* (సింహలలాటములు) and *Nāgapanālu* (నాగపణాలు) are sculptured. Over the base is an octagonal pillar, four sides of which bear images of goddesses; the other four sides contain fine floral work, such as flowers and lotus buds (Plate XIII, Figures 3 to 6, and Plate XIV, Figures 1 to 4). On the tops of the pillars are similar carved capitals (Plate XI, Figures 9 and 10). The *palakalu* (పలకలు) rest upon four lions and form a noteworthy feature of the design. It is intended to erect a dome over these piers.

Mahadvaram or the main entrance (Plate V, Figure 3). There are two entrances to the temple. Of these, the front or outer one, contains some very fine specimens of workmanship. The cornice slab or stone named *Mélurappu* (మేలురప్పు) bears an idol of *Rāja Rajēśvari* (రాజరాజేశ్వరి), another name of *Pārvati* mounted on a lion, with dragons on either side, and carved with work resembling fine tracery (Plate V, Figure 3). There is a *kamalam* (lotus) below, and a lizard on either side. Below this, is a *Makarathoranam** (మకరతోరణము) with a seated figure of *Gaja Lakshmi*, and figures of celestial nymphs on either side (Plate V, Figure 3). On the

* A *thoraṇa* or festoon of cloth, cut in the shape of a *Makara*, or a crocodile, and attached to two poles, which, in processions, as an emblem of distinction, is carried before idols, priests, and kings.

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right side of the entrance are Vaishnava carvings, the most prominent of which is *Vēṇugōpal* (Plate V, Figure 3), while on the left are Saivite figures. The three-faced *Dattatrialu* (దత్తత్రియులు) and *Kālabairavaśćāmi* (కాలభైరవస్వామి) are among the more prominent (Plate V, Figure 3). The sculptures are all very artistically and minutely executed.

The gateway of the second entrance has an arch, with the figure of *Viśvarūpam* on the apex, and *Dasāvatārs*, carved on either side (Plate IX, Figures 4 and 5). Below these *avatārs* are images in the attitude of receiving pilgrims into the temple. These carvings are alternately interspersed. Plate VI, Figures 2 and 3; Plate VII, Figures 1 to 6; Plate VIII, Figures 2, 3, 6, 8 and 9; Plate XV, Figures 1 and 2; and Plate XVII, Figures 4 to 6 are illustrations of other carvings and sculptures of images, etc., in this temple.

Plate XIX, Figure 19, is a ruler in black stone, which is perfectly made, and exactly like the ordinary wooden ones used on an office table. Plate XIX, Figure 20, is a well finished flat platter in brown mottled stone with circular cut rings. It serves different purposes as occasion requires. It is used for keeping articles of worship, flowers, camphor, sandal, saffron, *akshada* (अक्षत) dyed rice—*kuṅkumam* (కుంకుమం)—red powder—frankincense, eatables, fruits, *pansupari* or betel leaves and nuts, prepared as offerings to images of worship, and to bathe small idols or to keep ornaments, or the wearing apparel of the images. Plate XIX, Figure 21, is a small oval mortar and pestle for grinding or mixing up medicine.

The rates of wages of the sculptors here, vary from Rupee 1, annas 14 and annas 12 to annas 10 according to the excellence of the work turned out by them. The finest quality of stone used is obtained from a quarry at Kencharakonda, in the village of Sirigipalle, a place situated about seven miles from Tadpatri.

Images of worship, named *Janardhanaśvāmi*, *Kanyakāparamēśvari*, *Nagarēśvarasvāmi*, *Kōthandarāmaśvāmi*, and *Chowdēśvari* were executed by these sculptors in the village of Uruvakonda, Gooty taluk. Besides these, they have worked at several other temples in the Kurnool and Cuddapah districts.

CUDDAPAH.—There are some workmen here, of the *Balija* and *Muhammadan* caste, who can carve ordinary rough figures on stone. They are neither experts, nor are they professional carvers.

Jammalamadugu Taluk.—From a kind of stone, available in the quarries at Talamanchipatnam, grinding stones, mortars, rollers and water troughs are manufactured, and sold by a certain class of people named *Voddars*. The houses here are generally built of a black slaty stone, but it does not seem to be suitable for carving, and only needs chipping or hammer dressing to be used in construction.

Peddamudiyam.—Plate II, Figure 3, shows the various kinds of instruments used by a Muhammadan sculptor in this locality. This profession was adopted by his father. His father and he learnt the art from the sculptors of Gumpramanudinne, now working at the new temple, Tadpatri. He is capable of preparing stone benches (footstools), rulers, ink-stands, pen-holders, staves, caskets, paper weights, boxes and any floral or sculptured work according to the pattern supplied to him. This sculptor admits the superiority of the workmanship of his teachers. Here also are two stone elephants made by the well-known Gumpramanudinne sculptors. They stand at the entrance to a stone-built tank (Plate XVI, Figure 6).

Prodattoor Taluk.—The carvers are *Kamsalis* (goldsmiths). These carve *Jaya Vijayās*, *Gajalakshmi*, door keepers of *Śri Vishṇu*, parrots, monkeys, elephants, horses, snakes and various other figures. The carvers from Gumpramanudinne, now at work in Tadpatri, have executed several temples in this taluk, with fine carvings, such as the *Śri Chennakēśvarasvāmi* temple at Chintakuntla and Gudipad; *Śiva* temple and *Kesavaśvāmi* temple at Pallavole; and the *Kanyakāparamēśvari* temple at Prodattoor. The last work has been executed on an extensive scale, with exquisite sculptural work, at a cost of a lakh of rupees Some of the examples here are Plate VI, Figure 4; Plate VIII, Figures 1, 4, 5 and 7; Plate IX, Figure 2; Plate X, Figure 5; Plate XI, Figures 6, 7 and 11; Plate XII, Figure 5; Plate XIII, Figures 1 and 2; and Plate XIV, Figure 6. Another temple is under construction at Chapad.

Rajampet.—Plate XIV, Figure 5, is a *yāli* pillar, in a temple here, executed by the Gumpramanudinne sculptors.

NELLORE.—Plate III, Figures 34 to 36, are illustrations of implements used by the sculptors at Sydapuram, and Figure 37 is the section of a soapstone vessel, used for domestic purposes, like those in Plate XIX, Figures 10 and 11.

NORTH ARCOT, *Arkonam.*—A family of stone carvers, from Tirumanikuppam village of the Sriperambudur division (Tiruvellore taluk), is now working at a new temple, under construction in Ponnai village of this division. They are of the *Kammāla* caste. Their daily wages vary from eight annas to one rupee per diem

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according to the skill of the artizans. Besides these, the employers are bound to supply the family of the skilled worker with food, thrice daily, whatever the numbers may be, including occasional guests. Others, whose wages range between eight to twelve annas, are supplied with one meal daily. The master workman here is capable of doing inlaying work. But no example of the kind is to be seen. These people can make small images of *Gaṇēśa*, *Hanuman* and Serpent from a greenishstone, obtainable in the neighbourhood. These they sell to the public.

Chittoor Taluk.—There are half a dozen *Pañchamās* in Gangadaranallore of this taluk, who make domestic utensils from soapstones, available from the quarries in a neighbouring village.

Pōlur Taluk.—In Modayur village, seven miles east of this place, are eight or nine stone carvers, and there is another at Kalambur. These are *Kammālas* by caste. They have worked at the Kailāśanāda, and Pōlur temples. The stone used in these temples is a dark coloured schist from Sumbiamangalam tank, four miles from Modayur.

Madras.—The sculptors include *Nāidus*, *Mudaliars*, *Vanniyars*, and *Kammālars*, all residents of Madras and Thenampet. They work at different kinds of granite and marble, a description of which is given on page 2 under 'Stones or other materials used'. Examples of their work are found in the different cemeteries and churches in Madras (Plate XVI, Figures 4 and 5; Plate XX, Figures 9 to 14; and Plate XXI, Figures 1 to 7); in the Hindu temples of *Ranganādaśvāmi* at Kōmaḷēśvaranpet (Plate XVII, Figures 1 to 3 and 10, and Plate XVIII, Figures 1 and 2); *Parthasarathy* Śvāmi at Triplicane; *Ēkāmbarēśvaraśvāmi* at Black Town; and in the several public buildings—the Senate House (Plate XI, Figures 4, 5 and 8); Presidency College; Chepauk Palace (Plate XV, Figures 5 and 8, and Plate XVI, Figure 2); Law Courts; Law College; Madras Bank; Post and Telegraph Office; Young Men's Christian Association buildings; Literary Society's rooms; Lawrence Asylum Press, new buildings (Plate XV, Figures 6 and 7); old Museum buildings, Nungambakam (Plate XV, Figure 3, and Plate XVI, Figure 1); and the Veterinary College, Vepery (Plate XVI, Figure 3). Plate XVIII, Figures 4 and 6 to 9, and Plate XIX, Figures 1 and 2, are illustrations of figures and images in possession of Messrs. Fenn & Co., Monumental Sculptors, Madras.

Chingleput, *Conjeeveram Taluk.*—A *Nandi mandapam* has been built in the *Ēkāmbarēśvaraśvāmi* temple here. The stones used are hard and black from Pattimalaikuppam near Walajabad, and Edakuppam stone, white and soft, from Walajanagar. The first kind is suited for carvings, and the second for use as slabs. The workmen comprise *Āśāries*, *Nāidus* and *Mudaliars*. Plate IX, Figure 6, and Plate XV, Figure 4, are illustrations of the work mentioned above.

Salem.—In one or two villages in the Omalore division of this district, soapstone is found in great abundance. The masons make all kinds of culinary utensils, used in Hindu houses, from this stone.

South Arcot, *Chidambaram Taluk.*—The Śiva temples of *Natarāja* and *Elamayakkinar*, contain good specimens of carving, and are being repaired by Nattukottai Chetties (Plate IV, Figure 1; Plate X, Figure 2; and Plate XV, Figure 9). The sculptors are experts from the Madura district, and the work executed, consists of various kinds of ornamental work, large pillars, etc. The workmen are of various castes, *Āśāris*, *Muhammadans*, *Nādārs*, *Padayāchis*, *Thōttiers*, *Vaduga Naidus* and *Vellālars*. The stones used are obtained from Mailam, Tiruvaṇṇāmalai, Tirukkoilur and Woriur. Other examples of their work are at Chidambaram, Tiruvānakkaval, Tiruvaṇṇāmalai, Karūr, Koḍumuḍi, Śvāmimalai, Rāmēśvaram, Tiruppangur, Tiruvangādu, Tiruvāloor, Mailam, Tirukkoilur, Mysore and Kāñchīpuram.

Cuddalore Taluk.—The Śiva temple at Tiruppāpuliyur of this taluk is being reconstructed by Nattukottai Chetties; and the sculptors are of various castes, *Kollars*, *Kodikal Vellālars*, *Kammālars* and *Naikars*. These are natives of Devakottai, Iluppakodai, Methur, Kondadevi, and Soorakudi of the Madura district, Tirupandal of the Tanjore district, and Chidambaram, Tiruvananallur of the South Arcot district. Their workmanship is said to be fine.

Tindivanam Taluk.—A sculptor in Mēlchittanur, a Jain village, eleven miles west of this place, has carved several idols in a Jain temple there. He is a *Kavarai* by caste, and his wages are twelve annas a day. There are about ten carvers in Erayur, a village in the Villupuram taluk.

Coimbatore.—Plate III, Figures 1 to 6, are implements used in stone carving. Figure 7 is the bellows used by the smiths. Figure 8 is a saucer lamp made of soapstone. It is such as has been used by Hindus for centuries. The advantage in using these lamps is, that they do not consume much oil within a short space of time, but allow a slow consumption. To prevent the lamp getting hot, it is usual to place such lamps on moist or wet cowdung, which tends to keep the lamp cool, and prevent its breakage, or the boiling of the oil, by the

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heat of the flame. These lamps last for a considerable time, and can be used indefinitely. Hindus are known from time immemorial, as worshippers of the elements (according to Hindus, the earth, water, fire, air and e' One of these ceremonies is practised every day. The housewife or her daughter cleans the lamp every even fills it with oil, and puts in a new wick. When the lamp is lit, it is worshipped. This consists in smearing the projecting back part of the lamp with saffron, and adorning it with a dot of *kunkumam*—red powder—suspending a garland of flowers from the projecting hinder part of the lamp, burning a sandal stick fixed into the cowdung, placed under the lamp, applying sandal, burning a piece of camphor, and then throwing *akshadai*—dyed rice—mixed with flowers in front of the lamp. This is concluded by a prostration by the person who lights it.

Whenever brass lamp posts are used, they are similarly cleaned and worshipped. The place, where the lamps are placed, is first swept, then smeared with cowdung, and the spot decorated with *kōlam* (கோலம்)—which consists in making curious figures with white stone or rice powder, and in some cases, white earth (pure *sudda mannu*) (శుద్ధమన్ను). These figures are very curiously devised by Hindu girls and women. They, at times, try their best to excel their neighbours by the excellence, attained in their designs, which include the most intricate linear and dotted figures. In addition to these, there are often the figures of animals, birds, reptiles, tortoises, tanks, forts, *Brindavanam* * and such other designs. The place thus ornamented, is also worshipped as mentioned above; thereon, a small plank made for the purpose is placed, on which figures as above, are described. It is on this plank, the brass lamps are set.

Plate III, Figures 9 and 10, are soapstone domestic utensils. Their uses are similar to those in Plate XIX, Figures 10 and 11. Plate III, Figure 11, shows a stone cornice executed in this part of the country. It is of soapstone. There are some good sculptors in Koḍumuḍi near Erode.

The *Kalyāṇapasupathīśvaraśvāmi* temple at Karūr is being repaired by Nattukottai Chetties. Men of different castes, *Kammālars*, *Shōlia Vellālars*, *Agamudiars*, *Ambalagārs* and *Vellālars* work here. The work is of an ordinary kind.

Dharapuram Taluk.—There are some workmen here who can only do rough work such as grinding stones and troughs for cattle.

Palladam Taluk.—Near the village of Settipolliem, and in the hamlet of Muthanampolliem village, some good crystal work is done. The manufacturers are *Jangamandis* or *Kallandis* by caste. They generally make pebble spectacles and small idols such as *lingams* and *Vināyakās*. Plate XX, Figures 1 and 2, are illustrations of some of these. The crystal *lingam* and *Vināyakā* are finely finished pieces of work. Their uses are similar to those in Plate XVIII, Figures 3, 5 and 10. The spectacles are in finish, equal to those sold in shops, and if encouragement were given to what is, at present, little more than a locally known industry, much greater results might be expected, for the workers evidently know how to produce a good and well finished article. The stones are obtained from valleys in this district, and from Colombo, Vallam in the Tanjore district, and Madras.

South Canara.—A few Konkani Brahmins, in the village of Karkal, Udipi taluk, make (from a kind of granite obtained from a quarry at Nellikar near Karkal,) various Hindu idols, and seals with Italic, Gothic, Devanagiri or Kanarese letters cut on them (Plate XX, Figures 3 to 6). These seals, in a black polished stone, are faultlessly cut, and perfect examples of such work. The two in the second row and those on the fourth, are illustrations of the seals, and those in the first and the third are impressions made from them.

Such seals are also made from stones, *Nakshtrashile* and *Śāligramshile* and pieces of thick glass. The carvers are also capable of engraving figures, busts, &c., but not so well as to make exact impressions. They do not usually work for daily wages, and if asked to do so, would claim a rupee per day. Two rupees are generally charged for each seal, and these prices vary according to the complication of the letters.

Malabar, *Chirakkal Taluk.*—At Taliparamba and Kunnaru in Cheruthazham amsam,† are half a dozen families of stone carvers. They are not natives of this district, but are immigrants from the Tamil districts. They wear hind locks or *Kuḍumi* (குடுமி) unlike the natives of the soil. A few years ago, they sculptured some images, besides other figures of two *Dvārapālakās*, (door sentinels) in a temple, built by Varvakot Nambudri in Cheruthazham amsam. Last year, some of them built a doorway of granite with some fine floral work, in the temple at Trichammaram near Taliparamba.

* A raised piece of ground, inside of a house, within which the Hindus of the Vishnu sect raise and preserve the purple stalked basil, *Ocimum sanctum*, a plant sacred to that deity.

† *Amsam* means a village.

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Walluvanad Taluk.—The carvers here, are locally known as *Kallan Mūppans*. They follow the *Makkatayam.** Workmen of high attainments are honoured with the title of *Panikkar*. They live scattered in different *amsams*, such as Kunnatara, Panamanna, Palapuram, Pulamantkole, Chemmalasseri, Angādipuram and Cherpalcherry in the taluk. Their work chiefly consists in the carving of images.

TRICHINOPOLY, *Jambukēśvaram temple.*—The workmen here, are chiefly from Ambil, Bikshandarkoil, Chidambaram, Devacottai, Devaripatti, Esanakorai, Iluppagudi, Kanadikattan, Karakudi, Kottaiyur, Manakal, Nattarasankottai, Puducottah, Pudukudi, Pondamangalam, Sivaganga, Srirangam, Surakudi, Tiruvallarai, Tirumayam, Thanjure near Puducottah and Woriur, and number about 200 in all. They are of different castes, such as *Kammālars*, *Ambalagārs*, *Padayāchis*, *Vellālars*, *Nāiks*, *Kallans*, *Maravars*, *Agamadiyās*, *Udayārs* and *Kaikalars*. The preliminary outline of the rough work is done alike by all these people; while, delicate workmanship is performed by the *Kammālars*, the only class reputed to be experts therein. The polish done by the *Ambalagārs* of Woriur is excellently fine. Of these workmen, Kannanantha Stapathy, son of Appavu Stapathy *alias* Appavu Achar of Nattarasankottai, in the Sivaganga Zamindari, and his brother Marutha Stapathy are considered experts. Others are from Thirumangalam, Lalgudi Firka, and at Manakal. Examples of works are:—The Rock Amman temple in Trichinopoly; the innermost four pillared *mandapam* at Srirangam; one at Woriur; and those, now in progress at Jumbukēśvaram. Other articles produced by them are marble stone tables, prepared from the stones obtained at Garudamaugalam of the Perambalur taluk. Workmen at Perambalur, from a light stone, form images of *Ganēśa*, *Rāmaśvāmi* and others. Nallasami Naik of Manakal in Lalgudi can make carvings from a crystal stone, found in Vallam near Tanjore.

TANJORE.—The finest specimens of notable work are the Karurar deity in the *Sri Brahadēśvaraśvāmi* temple, Tanjore; the *Mīnakshiamman* idol in Karnathangudi; figures of *Subramanya*, *Nandi*, and *Mahālinga* in Tirumalavadi, all executed by Mahālinga Stapathy, a mason here.

Mayavaram Taluk.—The only carver at Darmapuram, a *Kammāla* by caste, can prepare idols. His wages are ten annas for rough work, and from a rupee to a rupee and a half for fine work, per day. Stones used are those got from Mailam in the South Arcot District.

Mannargudi Taluk.—Workmen of different castes, such as *Kammālars*, *Agamudiyars*, *Valayars* and *Padayāchis* from Devacottai are working at the temple of Tirunatyathangudi in this taluk. Their workmanship is highly artistic. Plate XVII, Figures 7 to 9, are illustrations of some of the sculptures here. The stones used, are from Mailam, Trichinopoly, Karūr, Sivamalai and Thenkolathur. Conjeeveram, Chidambaram, Kalahasti, Tiruvānakkāval, Tirugunallikkaval and Tiruthangur also contain examples of work executed by the men, now working here.

Kumbakonam Taluk.—The only examples of fine carving work in the taluk, are at Śvāmimalai and Kumbakonam.

Nannilam Taluk.—In the course of repair to the *Thyāgarājaśvāmi* temple *gōpuram* here, some recent carving work has been done. Plate IX, Figure 3, is an illustration of a pilaster, at the entrance, below the *gōpuram*.

Shiyali Taluk.—The information available, is that there are some carvers at work in a temple at Tirupangur of this taluk.

MADURA.—The workmen are *Kammālars*, *Nāiks* and *Maravars* by caste. Examples of their work are the temple at Madura; Kalayarkoil in the Sivaganga Zamindari, Tirupathur Division; temples in Kōvilur, Pillaiyarpatti, Vyravanpatti, Nēmum, Ariakudy, and Poovāndipatti, Tiruvadavai Division; temples at Devacotta and Kandathur, Aruppukottai Division; and at Aruppukottai, Tirushuly and Pālayampatti.

Palni Taluk.—In the temple of Thiruvarankudi, is a stone chain of three or four links in length, prepared by the sculptors. The stones used are:—A kind of black stone from Thummanachanayakanoor, white stone from the Buthamalai hill in Tiruparangundram, and a copper coloured stone, found in Aruppukottai all in this district.

TINNEVELLY, *Ambasamudram Taluk.*—Smiths are the carvers here, and they are only three in number, one at Kallidakurichi, and the other two at Pappanguiam. They have worked at the several temples here. There is a large well known quarry at this place, which is about six miles from the taluk head-quarters. New works in

* The law of inheritance of property from father to son and not to daughter.

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progress at Madura, Rāmēśvaram and other places, are in process of being executed, from the stones obtained and sent from this quarry.

Nangueri Taluk.—The only reputed carvers here, are two persons now engaged at Devacottai, Madura district. The *Krishnan* temple in the taluk head-quarters, with fine carvings, exhibits specimens of their workmanship.

Sankaranainarkoil Taluk.—Smiths and *Maravars* are the carvers. One of them, Pichayan Perumal Aśari, son of Vaikuntam Azhagappan Āśari, has distinguished himself by the excellenceof his work. Most of these men are natives of Kazhugumalai, Puliangudi, Vāsudēvanallur and Vadikottai of this taluk, while only one of them is a native of Sankaranainarkoil itself. Some examples of their workmanship, worth mentioning, are at Puliangudi, Vāsudēvanallur, Kazhugumalai, Karivelavandanallur, and Perambattur. The finest of all, are the statues of the late Zamindar of Sivagiri, Chockalingam Pillai, and a Tambiran of Thiruvadudurai Mutt, at Sivagiri, Vāsudēvanallur and Sevandipuram in Ambasamudraiu, respectively.

Tenkasi Taluk.—There is a *Kammāla* family of three brothers in this taluk, who work at stone carving. Their works consist of images of various deities and *Vāhanams* in some villages of the taluk.

Srivaikuntam Taluk.—An elaborate and extensive work is being carried out in the construction of the *Shanmuga Vilās Mandapam*, in the *Subramanyāśvāmi* temple at Trichendur. Very fine carvings are being executed, though they do not approach the finish of the old carvings and sculptures in the district. A sum of about Rs. 20,000 is reported to have been incurred. It is estimated that the cutting and carving of a single pillar cost Rs. 800, (Plate X, Figures 4 and 6, and Plate XI, Figures 1 and 2).

Tinnevelly.—The only modern work that has been executed in the *Nellayappar* temple in the town, is a beam (Plate XIV, Figure 8).

Coorg.—The carvers or *Kallukuttigārs* of this Province, are limited to six families. They are in the Palur and Hodavada villages of the Padinalknad taluk. They are not natives of the soil, but are immigrants, their ancestors being brought there in connection with the construction of the palaces of the old Rajas. They speak not only Tamil, but are also conversant with other vernaculars, such as Kanarese and Malayalam. The stones used are from the Palur village. The men are able to do fine carvings, but have no scope for such. The following are illustrations of the articles they generally produce. Plate XIX, Figures 14 to 17 are used as grinders for curry stuff, medicines, etc., and Figures 14 and 16 are, for pounding ragi, rice, etc., into flour. The former is priced at Rs. 6 per set, and the latter at Rs. 3 per set.

The following taluks are reported to have workers, who can only do partial (rough ordinary) stone cutting; and in some cases, no stone carvers of any kind. When artizans are required, they have to be imported. As there are large towns in some of these taluks, and fairly large ones in the most of them, the decadence of the industry is evident.

Ganjam	Chicacole and Gumsoor.
Vizagapatam	Palkonda and Sarvasiddhi.
Godavari	Bhadrachalam, Coconada, Nagaram and Peddapur.
Guntur	Bapatla, Narasaraopet, Ongole, Palnad, Sattenapalle and Tenali.
Krishna	Bandar, Bezwada, Nandigama, Narsapur and Nuzvid.
Bellary	Adoni, Alur, Bellary, Kudligi, Hadagalli and Rayadrug.
Anantapur	Anantapur, Dharmavaram, Gooty, Kalyandrug, Madakasira and Penukonda.
Cuddapah	Badvel, Kadiri, Madanapalli, Pulivendla, Pullampet, Royachoti, Sidhout and Voyalpad.
Nellore	Atmakur, Gudur, Kandukur, Kanigiri, Kavali, Nellore and Rapur.
North Arcot	Chandragiri, Gudiyattam, Palmaner, Polur, Vellore, Walajapet and Wandiwash.
Chingleput	Chingleput, Madurantakam, Ponneri, Saidapet and Tiruvallur.
Salem	Atur, Dharmapuri, Krishnagiri, Tiruchengode, Tiruppattur and Uttankarai.
South Arcot	Kallakurichi, Villupuram and Tirukkoilur.
Coimbatore	Bhavani, Erode, Kollegal, Pollachi, Satyamangalam and Udamalpet.
South Canara	Coondapoor, Kassargode, Mangalore and Uppinangadi.
Malabar	Calicut, Ernad, Kottayam, Kurumbarnad, Palghat and Ponnani.
Trichinopoly	Musiri, Perambalur and Udayarpolliem.
Tanjore	Tiruttarapundi.
Madura	Dindigul, Melur and Periakulam.
Tinnevelly	Otapidaram, Sattur and Tinnevelly.

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INLAYING WORK.

The Hindus in the south of the Indian Peninsula, at least, have never shown much inclination for, and have left few examples of inlaying, either with coloured tiles or stones of varied colour. In ancient buildings, I know of none of the latter, and I have only met with a few of the former at some buildings in Vijayanagar and Chandragiri. These, however, have been so despoiled, that little or nothing remains on the wall surfaces, beyond the plaster squares in which, the tiles had been set.

Very different is it with the Muhammadans in the North of India, who have left many fine examples of inlaying in precious and other coloured stones and tiles. Their terms of occupation in the south, were probably too precarious, and of too short duration, to admit of their carrying this art to perfection, as they did in the north, or of even introducing it. It was a lost art, or one never acquired by other races in the south. The magnificent examples of Muhammadan inlaying, existing in even obscure buildings in the north, have no counterpart in Southern India.

In reports received from every taluk in the Presidency, there is not a single mention of any inlaying work being done. It is evidently an extinct art in these parts ; and it is extremely doubtful, if it ever existed in Madras.

In public buildings, private offices, banks and other buildings in Madras town, which bear some pretention to architectural design, there are examples of mosaic inlaid work, composed of different forms or figures of tiles. But, for true inlaid work, in its proper form in stone, there are no examples. Some good specimens have been executed at the new Palace at Mysore, the workers having been specially brought from Agra. I learn that local workers have taken to the work, having learnt the methods from the imported artizans. Illustrations of what has been done there, will be found in Plates XXX and XXXI.

The Madras Government in ordering me to prepare this monograph, directed special attention to the works now proceeding at the new Palace in Mysore. Thus, the Executive Engineer M.R.Ry. B. P. Raghavalu Naidu, A.E., had the following particulars prepared by Mr. S. Srinivasa Aiyar, Sub-Assistant Engineer.

THE STONE CARVING AND INLAYING INDUSTRY IN MYSORE.

Stones available.—The tableland of Mysore situated, as it is, in the angle where the Eastern and Western Ghauts converge into the group of the Nilgiri hills, is not at all wanting in the different classes of stones commonly required for building and ornamental purposes. Mysore seems to consist mostly of Metamorphic and Plutonic rocks. The different kinds of stones are, granite, gneiss, trap, dykes of porphyry, horneblende, quartzites, chlorite and marbles. Every variety of granite is found ; but the prevailing granite is composed of quartz felspar, mica and horneblende. Fine granite porphyries are also common, and one specimen composed of a basis of compact, reddish and salmon coloured felspar and a little quartz occurs in a dyke in Seringapatam. Rocks of gneiss disrupted by trap seams and porphyritic fine grained granite, are found in Bangalore. Gneissose rock, is abundant in Bangalore and used for building purposes. Slabs from three inches to 2 feet thick are easily got by the simple application of heat, and are easily split to the proper dimensions. Pillars, 23 feet long are used as telegraph posts; and single stones 35 feet in height and 15 inches square are used as pillars and plastered in the Central College of Bangalore. These stones are also used for architraves and culvert girders up to 8 feet span ; they work easily as arch stones, and look like chisel dressed stones, though only hammer dressed. Enormous granitic masses are found in Savandurga and Sivaganga in the Bangalore district. The rocks in the Kolar district are similar to those of Bangalore, but the gneiss has a smaller admixture of mica and paler felspar. Near Turvekere in the Tumkur district, is a celebrated quarry in a ridge, half a mile long. The stone obtained is black in colour and called *Karikallu* (black stone) by the natives. It is a chlorite rock and takes a beautiful black polish. Pillars out of this stone are said to be in Hyder Ali's Tomb in Seringapatam. Beautiful vases are made of this stone polished. In the neighbourhood, pot or soapstone is found, used for making vessels, pencils, &c. At Karikalgudda near Tiptur, is found an old quarry of black horneblende extensively applied to temple construction. The same kind of stone is also found at Dabbagatta near Tiptur. Common granite for masonry is abundant in the Mysore district. Black horneblende and pot stone are also found. Good pot stone from which the images in the temple at Halebide and Belur are carved, is found in four places in the Hassan and Belur taluks in the Hassan district. There are also granitic hills in this district At Chittaldrug, may be seen at the base of a granitic cliff which tops one of the hills, a porphyritic looking mass formed of a reddish clayey paste imbedding reddish crystals of felspar.

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STONES USED IN THE PALACE, MYSORE.

The most important of the stones now used in Mysore is the granite, quarried from the Chamundi hill which lies south-east of the town. It is a very hard granite, and is found in different colours. It is largely used for walls and pillars, and coping slabs and for big arches. It can also be carved, but does not admit of very deep and intricate designs to be carved on it, being very hard. The stone is also largely used for hand rails and pedestals of parapets. The red variety of this granite is used for pilasters and for parapets. All the varieties take a beautiful polish, especially the red. The cost of a cubic foot of stone, varies from ten annas to fourteen annas at site. The rate of polishing one square foot, varies from one to two rupees for plain surfaces. Eleven domes for the new palace are being made of this stone polished.

The next in importance in the stones used, is got from Turvekere in the Tumkur district. It is dark in colour and closer grained than the granite. It is chiefly used for pillars in the inside of buildings, and for small arches and brackets for supporting coping slabs. It is very easy to work on, and admits of very elaborate and intricate carving, and retains a sharp edge. Many beautiful specimens can be seen in the palace works, an example of it is the *Gaja Lakshmi* figure. The stones are also used for parapets, panels, &c. It may also be used for flooring slabs; it takes a beautiful polish, very black in colour. Thick cornice blocks are made of this stone, and fitted below the domes. The stone costs from Rs. 1–8–0 to Rs. 2–0–0, per cubic foot delivered at site.

The next stone in importance, is the pot stone, got from villages near Mysore. It is even easier to work with, than the Turvekere stone, since scratches can be made on it even with the finger nails. It is greyish in colour but becomes black when polished. It also admits of the most intricate designs to be carved on it. Many carved stones of varied design are worked from this stone, and the depth and boldness of carving it admits of, is wonderful. Many human figures are also carved on this stone. This stone also costs from Rs. 1–8–0 to Rs. 2–0–0 per cubic foot.

Another stone, which is largely used, is what is known as the Kyathenahalli stone, got from Seringapatam. This has a chocolate colour when quarried, and taking a high polish, becomes red in colour. This stone is even harder to work than the Chamundi stone, and more costly, costing Rs. 2–8–0 per cubic foot. This is a very fine porphyry, and can be much used for ornamental purposes. Many fine polished pillars have been cut in it, in the marriage pavilion gallery. It is always used polished, and makes beautiful hand rails of parapets. Two *vimānam** arches made of the stone, and polished, are fitted on the front of the building and attract the attention of visitors to the palace. The stone is too hard to carve on, and no carving has been attempted on it. The stones Chamundi, Turvekere, pot stone and Kyathanahalli may be put in, adjacent to one another, so as to make a beautiful combination of colours; and many examples† of this combination can be seen in the Palace.

These are the chief stones employed for ornamental purposes. Other stones, that are being used, are stones from French-Rocks, which are used for walls. These are gneisses.

WORKING.

The stones are generally brought to the site in blocks one or two inches bigger on all sides than the required dimensions. Then, one face is dressed rough, and the opposite is done afterwards, so that the required thickness may be obtained. The chisel is generally a short piece of steel, about five inches long and circular or square in section, with a thickness of about an inch. To obtain the required thickness of the stone, the same is set off from the first dressed face, by means of a square. This setting off being done at the two ends of the length, a piece of thread, dyed in red ochre is lined to join the two joints set off, and this line is struck on the face of the stone. This side is then dressed fine, and the same operation is done on the other face of the stone. If the block of stone brought, is more than two inches thicker than the dimensions required, a chisel called *Udaṛāpu* (ಉಡಾರಪು) is used to break the stone. Another form of chisel called the *palmunai* (பல்முனை) is used in completing the dressing of the stone. It consists of a number of points very close to one another; and the closer they are, the nicer does the dressing effected, become. The chisels that are used in the working of the softer kinds of stone, like the Turvekere and soapstones, are much thinner and longer. Some have pointed edges and the majority, chisel-like flat edges. The long pointed chisel is generally used in the final dressing of

* *Vimānam* literally means a car or chariot of the gods, serving as a throne or conveyance through the skies, self-directed and self-moving. Here, it might mean a throne or the pinnacle or upper-dome.

† *Vide* photos. Verandah arches and octagonal balcony. (Plate XXVII, Figures 1 and 2).

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the Turvekere stones, and brings about a fine surface. When stones of intricate forms are to be dressed, templates made of sheet iron are cut to the required form, and with the help of these templates, the workman cuts his stones.

POLISHING.

The polished stones used, are usually those from Chamundi and Kyathanahalli. Before describing the process of polishing, it is necessary to describe the method of preparing steel powder used in the process. Generally, old and worn out chisels are used in preparing steel powder. The steel bars used, are first heated to a high temperature, and hammered into flat sheets. The sheet is then folded round, dipped in water and then broken into pieces by a big hammer. These pieces are used for polishing stones. The bigger pieces of steel powder are first rubbed over the surface to be polished with the aid of a piece of hard stone by sprinkling water over the surface. The smaller pieces are then used similarly, until the hard portion of the surface to be polished become fairly smooth. Then, a piece of artificial stone one-fourth inch thick, and about four by five inches, known as *sanai* (ಸಣೆ) prepared by heating a mixture of sealing wax and *kuruvindam* (ಕುರುವಿಂದಂ) powder is rubbed over the portion to be polished. All these operations have only smoothened the surface. Then a powder, prepared from a block of *kuruvindam* (ಕುರುವಿಂದಂ) stone, is rubbed on the surface with water by means of an iron handle, the bottom of which approximates to the curvature of the surface operated upon. The handle is of iron when used for Chamundi stones, and of copper for Kyathanahalli stones, as the surface of the former imparts a black colour to the red polish of Kyathanahalli stone.

CLASS OF CHISELLERS.

The chisellers that work at the stone industry in Mysore, may be broadly divided into two classes:—Men from Madras, and those from Kolhapur, Belgaum, &c. It is a pity that ina place like Mysore, where more than 500 chisellers are working, native chisellers of Mysore are very rarely met with; and of these, almost all learned their work after commencement of the reconstruction of the Palace.

The chisellers from Madras may be divided into two classes:—Men from Madras city and suburbs, and those from the Southern Districts. The chisellers from the North Arcot, Madras and Chingleput districts are of the former class; and South Arcot, Tanjore, Trichinopoly and Madura, contribute to the men in the latter class. The chisellers from Madras are more in number than those from other districts, whom they call "Southerns." They chiefly work on the hard Chāmundi stones, and do not take much to working on the softer stones like the Turvekere and pot stones, though they can do justice to that work. They do not also much employ themselves on carving, but work only on the dressing and fitting of stones. They learned their work in Madras, working on stones from the hills at Pallavaram. The chief castes that represent Madras are, the *Nāyakars* and *Āśāris*. The former belong to the *Pallies* and are of low caste. Stone working is not their hereditary industry but has been more or less taken up for a livelihood. The *Āśāris* belong to the class called *Kammālas*. These comprise blacksmiths, silversmiths, goldsmiths, carpenters and stone masons. All these are more or less equal in the social scale, and the same man knows two or more of these crafts. They are of a superior class to the *Nāyakars*, and the stone industry is their hereditary occupation. These *Āśāris* are called *Śilpis* of Southern India. There are also a few *Mudaliars* and *Nāidus* in the Madras class.

Of the chisellers from the Southern Districts, *Pillais* and *Śervēs* form the greater portion. There are also some men from the classes called *Kallars* and *Vaduvars* in the Tanjore and Trichinopoly Districts. Some *Nāidus* from Chidambaram are also working. Some of these men work in the Turvekere and pot stones and others in Chamundi stones. They have been trained in the construction of temples at Chidambaram, Tiruvánaikaval, (Trichinopoly), Kunnakudi (Madura), &c. They had only hard stones like the Chamundi stones in these places to work with, but have learnt to carve beautifully in the Turvekere and pot stones. They are specialists in the deep carvings of scrolls in pot stones called *Kanikku*, and some of them are clever in the carving of *Vigrahas* (विग्रह)—images or idols for worship—(Plate XXIV, Figures 1 to 6). There are also many *Áchāris* in this class of workmen. The pot stone scrolls with the lion, *Gandaberunda*, eagle, &c., are some of the carvings of this class (Plate XXV, Figures 1 to 5)

KOLHAPUR MEN.

Even in this class, only some are hereditary stone masons, while others learned the work to eke out their livelihood. The hereditary chisellers are called *Gowndies*. Though all the chisellers under this class have come from Belgaum and Kolhapur, and not one from Dharwar, all these are called *Dharwaries* by the Tamil speaking

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chisellers from Madras. These latter are called by Kolhapur men *Arvis* meaning those who talk *Arava* as the Tamil language is so called. The Kolhapur chisellers are better able to work in the Turvekere and pot stones than in the Chamundi stones. They are exceedingly clever in the carving of *Vigrahās* on pot stone. Many examples of them are shown in the photos accompanying, viz., the Balakrishna figure on the five-headed serpent. the native lady with the flower garland round her body and the lady in a sitting posture, &c., (Plate XXIV, Figure 4, and Plate XXVI, Figures 1 to 3). Many similar examples of such carving in pot stone can be seen in, the palace under construction, fitted on the pilasters above the pillars in the inner courtyard. The Kolhapur men are also very clever in clay modelling. This art is a special feature of the men from Belgaum. The natural posture and attitude of the models in clay are lifelike. The subject taken for modelling is generally from episodes in the *Rāmāyana* and *Mahābhārata*. Some examples of the modelling are :—*Draupadi Vastrāpaharaṇā*, *Damayanthi Swayamvara*, *Sītākalyana*, *Rukmani Swayamvara*, *Indra Sabhē*, &c. (Plate XXIV, Figures 1 and 6). Other examples are the *Mahishāsura Mardhana*, *Gajalakshmi*, &c. (Plate XXIV, Figure 3). Another model group representing *Rāmā*, *Lākshmana* and *Sīta*, the chief personages in the well known epic *Rāmāyana* is specially worth noting, portraying as it does the fine and grand face of *Rāmā*, the hero. The ease, with which they make the clay assume any form they want and the finish they give to the figures, show a decided talent in them for the mastery of this art. Many of these modellers are equally good in stone carving, wood carving and in stucco work. The only thing they seem to be a little defective in, is the want of quickness in working on the hard stones like the Chāmundi. Many of these work very well on marble carving and fitting. The Kolhapur chisellers are of various classes. It is not only people of a particular caste that are well up in stone carving. Musalmans, Vyshyas, Maharattas all contribute men to this industry. The wages of the ordinary chisellers vary from As. 12 to Re. 1 per day. But some of the clay modellers and *Vigraha* carvers get from Rs. 1–4–0 to Rs. 1–12–0 per day.

Of the Mysore chisellers, there are only two brothers come from Kollegal who do fine work, and who have completed the *Vigrahā* of *Mahā Vishnu* in pot stone, shown in Plate XXIV, Figure 2. These are of the *Āsāri* class, who may have been connected with Southerns, and who also work at silver and gold. There are a few families of these *Āsāris* in Dēvanahalli, Bangalore District. These are the men who supply *Vigrahās* for all temples of Mysore. It is their hereditary occupation.

STONE INLAYING.

The chief stone employed on in-laying, is marble, as it is mostly on marble, that the in-laying is done. The marble is got both from Italy, and from a place called Makrana in Jeypore, the renowned quarry which has supplied stones for the famous structure of many Muhammadan Mosques. Makrana marble is reputed marble. This marble is quarried to any size or thickness. The Makrana marble is much purer, and has less of black veins running through it than the Italian, while the latter is slightly easier to work. The stone generally costs about Rs. 7–8–0 per cubic foot for big blocks. The prices of stones used in in-laying are given below :—

		Rs.	A.	P.	
Gwalior	"rathak", ... cost	0	1	6	per lb.
Jabbalpore "Gar" or green	... ... ,,	0	2	0	,,
Bombay "Melacihte"	... ... ,,	15	0	0	,,
Kabul "lips lazuri"	... ... ,,	2	4	0	,,
Mandalay "Demgasra"	... ... ,,	0	2	0	,,
'wai black stone	... ... ,,	0	0	6	,,
Jesselmere Yellow stone	... ... ,,	4	8	0	per maund.
Agra "E'Juba" stone	.. .. ,,	2	8	0	,,
Agra black stone	... ... ,,	2	0	0	,,
Seemuck stone	... ... ,,	0	2	0	per lb.
Kallilian	... ... ,,	2	4	0	,,
Seringapatam porphyry	... ... ,,		...		,,
Mysore green stone (quartzite)	... ... ,,		...		,,
Agra Abri stone	... ... ,,		...		,,
Madras sea-shell	... ... ,,		...		,,

The above stones are got from the places mentioned against each, in small blocks. They are then broken into smaller blocks and sawn into thin slabs about one-eighth inch thick, before being used for inlaying. The different operations for working at this industry are "stone powdering," "stone sawing" and lastly "stone in-laying."

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The stone powdering is done by small boys in Mysore, who get on an average from two annas to three annas wages per day. The stone that is powdered, is a block of *kuruvindam* stone, got all round Mysore, and costing about 14 annas per lb. The blocks are distributed to the boys for powdering, and the cost of powdering generally comes to about six pies per lb. Each boy has got before him a block of stone with the top side dressed about two feet by one foot eight inches. He places his block of *Kuruvindam* stone on this, and breaks it with the aid of a steel hammer. The *kuruvindam* gets broken into small particles. The boy then breaks these into still finer particles. Some of the particles have, by this time become powder. The boy then removes the powder by passing it through his cloth, which serves the purpose of a sieve, and takes to powdering the still unpowdered particles. In the same way, he goes on powdering. The *kuruvindam* powder prepared in this way, is of very great use in inlaying, as without it, the sawing of the inlaying stones cannot be effected. *Kuruvindam* stone is said to contain a larger quantity of silica than any other kind of stone.

The inlaying stones are sawn in the following way, by boys in Mysore, who earn from two to four annas by task. Seldom are boys employed on daily wages, except when they begin to learn, when they are paid only one anna. Each boy has before him a small block of stone or wood, about 1′ × 8″ × 4″. On this platform, is fixed a piece of wood about 3″ square in section, and about a foot high. The boy has also got a small fine vessel, or a hollow bamboo, serving the purpose of a vessel with water in it. He mixes the *kuruvindam* powder above described, with the water. He then gets some embers of charcoal, puts them into a wire basket, and holds this in his hand by the wire supporting the basket, on the top of the piece of wood above described, on which has been put a small quantity of sealing wax. The heat of the burning charcoal melts the wax, and when it is in a melting state, the boy fixes on it, the small block of inlaying stone, required to be sawn. The stone gets tightly fixed on the wood. The boy then proceeds to the sawing, which is effected by means of bows with one or two steel wire strings adjusted to the thickness of the slab required. The bow is then worked backwards and forwards by the boy, in the same way as ordinary plank sawing is done. The boy, before he commences sawing, takes with his left hand two fingerfuls of *kuruvindam* powder from the water vessel by his side, places it on the stone to be sawn, sprinkles a little water on the same, and then propells the bow by his right hand, once in about five minutes. He puts on more *kuruvindam* powder, and continues sawing. The wires will not cut the stones unless fed with powder. The different coloured stones, after being sawn into thin slices or slabs, are given to the inlaying men.

The inlaying men are generally from Agra; but now, many of the Mysore boys have learned the work, and are doing it fairly well, earning about seven to eight annas per day. The marble block is sawn into pieces, by means of a sawing machine or a hand saw. Even in the hand saw, there are two different classes, viz., a wire saw and the ordinary saw. All the three methods are employed in sawing marble slabs, which are then cut and dressed to the proper dimensions. These are then ready for inlaying. Before inlaying commences, the surface to be inlaid is dyed red with red ochre, so as to make lines on it made by chisels visible. Each inlayer is given a paper, on which the design of inlaying to be worked, is drawn in the different colours. The design is generally of a number of leaves and flowers running in proper and graceful curves, and closed by a neat border. The inlayer first cuts in very thin sheet tin, a copy of the specimen to be copied. Each small leaf has a thin tin sheet cut to its shape, and the different coloured portions of the same leaf have each a tin sheet cut to the shape of each When all the portions have been provided with tin copies, the inlayer takes the sawn stone slabs of the proper colour, and roughly cuts them to the proper form of the template. Each inlayer has a small grinding wheel, which he works by means of a twisted leather belt, acting on a wooden drum fitted on the axis of the wheel (Plate I, Figure 2). This grinding wheel is prepared by heating in a pan a mixture of two lbs. of sealing wax to one of *kuruvindam* powder, and forming the paste to the shape of a grinding wheel, about a foot diameter and one-fourth foot thick. This grinder is revolved with his right hand working the leather belt, while the inlaying piece is held by his left hand in contact with the edge of the grinding wheel, till the piece is gradually wrought to the proper form. He then takes the sample tin sheet and fixes it on the inlaying stone in the following manner. He holds a small thin sheet of mica with a pair of tongs on a pan containing charcoal embers, and places the inlaying piece on the mica sheet. He then puts a little wax on the inlaying piece. He then takes the inlaying stone in his hand, and makes on it with the chisel, the contour of the sample tin sheet. Having worked the contours, he again revolves the grinding wheel, and holding the inlaying piece in contact with it, reduces it carefully to the proper form, (Plate I, Figure 2). Thus, piece after piece is taken and reduced to an accurate form, by the aid of the tin sample sheet and the grinding wheel. Then, the stones representing the different portions of the same leaf, are joined together in the following way. As before, a mica sheet is held over

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a pan containing charcoal embers, and the two pieces are joined with the aid of melting sealing wax. Thus, the mica comes in very useful in this operation. The sea-shell is put in to represent the line, running through the middle of the leaf. Thus, each leaf is prepared to the proper dimensions and colour from the stones of that colour. Having thus prepared the different portions of the design, the inlayer marks on the surface of the marble slab to be inlaid, the position of the different portions of the design, by means of a pair of spring compasses, on the rectangular and polar co-ordinate method. He then takes a small pointed chisel, and firmly marks the positions. Then the inlaying piece, cut to the proper shape, is put in its proper place on the marble slab, and the inlayer makes the contour of the leaf or flower on the marble slab. The scooping out the surface of the marble slab to receive the inlaying piece then commences; it is a delicate operation and requires great care. After satisfying himself, that the scooping out is done to the proper surface and depth, the inlaying piece is fitted into the scooped area by means of a cement of honey wax and white lead. Thus, piece after piece is inlaid, and the whole design is worked out on the marble slab. Then, the marble slab is polished, and the whole thing comes out very bright in the end. The cost of inlaying an area of eight inches by eight inches generally amounts to Rs. 20. The cost of *kuruvindam* stone powdering and the stone sawing are extra.

GEOLOGICAL ASPECT OF MYSORE PALACE STONES.

(1) *Chamundi.*—Biotite granite, coarsely crystalline.

Colour—Mottled pinkish grey with dark green spots. This stone will polish well and keep its colour. Suitable for exterior work.

(2) *Chamundi.*—Granulitic aphite.

Colour—Slightly pinkish. It is liable to crumble on the exposed surface and also to discolouration.

(3) *Chamundi.*—Granite, medium grained.

Colour—Reddish with dark green spots. A fair building stone, but liable to become brown on exposed surfaces.

(4) *Chamundi.*—Red granite with dark green spots. Will polish well and form a handsome stone.

(5) *Chamundi.*—A fine grained salmon coloured granite; will take a high polish and keep its colour well, in interior work. May also be used externally.

(6) *Seringapatam.*—Porphyry reddish brown. The black spots are soft chlorite and will prevent an uniformly high polish from being obtained. The colour is not very good. There are some porphyries near Seringapatam of better colour, and more susceptible of higher polish than the above.

(7) *Kalvathpur*
(8) *Chinkurli*
(9) *Harikotte* } Grey granite gneiss.
(10) *Thonnur Betta*
(11) *Babi Betta*

These samples are all very similar, but Nos. 7, 8, 9, are somewhat fresher than 10 and 11, and will keep their colour better. These blocks will take a very high polish.

(12) *Turvekere quarry*—Chlorite rock—Colour—Greenish black. This is a soft stone which will take a high polish. It is suitable for interior ornamental work. It should not be exposed to wear.

(13) *Dēvegowdan Hundi*—Colour—Greyish black. A strong hard stone. Will take a high polish. May be used externally, and will stand a good deal of wear.

CARVING.

The chief of the stones on which carving is made to any extent are the Turvekere and pot stones. Both are equally well adapted for the purposes of carving, but the only difference between them is, that pot stone is a little too soft. The softness of pot stones is taken advantage of, by turning them and using them for balustrades and finials. Then, these are carved and put in position. The carvings in the balustrades, which have very little surface to carve on, are very delicate and small, and could only be attempted on soft stones, like the pot stone. The images of *Gōpāl Krishṇā, Nāga Kanyakā* of the balustrades, shown in Plate XXIII, Figures 8 and 9, are so minute in detail that they cannot be carved on the Turvekere stone, which is only a shade harder. This same hardness in the Turvekere stone, though it makes it unfit for balustrades, gives it a great advantage in

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another way. The panels *Sīta Kalyāṇam*, *Rukmaṇi Svayamvaram*, which are shown in Plate XXIV, Figures 1 and 6, cannot be easily done as well on pot stone, simply because, it is too soft. Chamundi stone, being much harder and liable to break off in flakes, does not admit of deep and intricate carving. The only carving that is attempted on this stone, is that on the bases and capitals of the pillars in the Darbar Hall of the Palace under construction (Plate XXII, Figures 1 and 2). The designs are easy, chiefly representing leaf designs. Other designs, such as birds and intricate foliage designs, which have been worked on the Turvekere stone capitals of the pillars of the Marriage Pavilion gallery shown in Plate XXII, Figures 2 and 6, cannot be worked on these pillars; nor can the cornice pieces, shown in Plate XXVIII, Figures 1 to 4, showing a line of stags and a line of elephants be done in a hard stone like the Chamundi. The cornice of pot stone, showing a line of peacocks put in the verandah gallery, and shown in Plate XXVIII, Figure 1, is a fine piece of carving, and deserves notice.

The longest block that has been used in the palace is twenty feet, and the section, one foot four inches by one foot three inches. Chamundi blocks, more than thirty-five feet long, can be had of two feet square in section. Chamundi stone is the best stone suited for pillars, as it has a large crushing strength, and can also be had in big blocks. The Turvekere stone may be easily sawn and used as flooring slabs. If polished, they will do very well for borders in flooring. The Chamundi stone can also be used as flooring slabs. Some varieties of them, grey in colour, when polished and used as flooring slabs, are as good and bright as marble flooring slabs.

The chief of the common articles prepared out of stones, are paper weights. These paper weights are made of all sorts of stones of various colours. Each stone generally costs from Rs. 2 to 3. Beautiful inkstands and ink bottles can be made out of pot stone. An inkstand of the kind is Plate XXX, Figure 3. The inkstands and bottles are less than half a day's work for a chiseller. Beautiful birds made out of this stone can be seen here, each bird generally costing about Rs. 2. These birds are made by men from Belgaum. Some of these birds are, Plate XXIX, Figures 7 to 12. The image of *Gōpālakrishṇā* in the *Kāliṅga Mardhanā*, Plate XXIV, Figure 4, is the work of a Belgaum man, and has cost about Rs. 35. The image of *Maha Vishṇu*, Plate XXIV, Figure 2, is the work of a Mysore chiseller and of another from the Southern Districts. It was also paid Rs. 35. Both these images are two feet in height. A chain of rings, made out of Turvekere stone, has fine rings with an interior diameter of three and a half inches, and one inch thick, and represents three days' work of a Southern District chiseller.

STATEMENT OF STONES WITH THEIR USES.

Kind.	Name of stone.	Quality.	Largest block available.	Girth.	Remarks.
Granite ...	Chamundi	Coarse grained hard ...	20′ to 36′ ...	6″ to 3″	Hard stone, fit for pillars, slabs 6″
		Fine grained	6′ to 10′ ...	6″ to 3″	
Porphyry ...	Seringapatam ...	Very hard fine grained red colour with crystals	6′ to 8′ ...	6″ to 2′ ...	Fit for short pillars and slabs 9′.
	Jakanahally ...	Do. ...	6′ to 8′ ...	6″ to 2′ ...	Do.
	Kyathanahally ...	Fine grained red colour; takes fine polish.	6′ to 8′ ...	6″ to 1½′ ...	Do.
Gneiss ...	Bangalore Saraky ...	Fine grained hard ...	20′ to 35′ ...	6″ to 1″ ..	Fit for pillars, slabs. An instance in which a slab 20′ × 20′, was prepared is also known.
	French Rocks ...	Softer variety of the same colour.	15′ to 20′ ...	...	Fit for slabs on size stone work.
	Kannumbady ...	.....	10′ to 15′ ...	1″ to 1½″ ...	Do.
Trap ...	Turvekere	Fine grained grey, green, when dressed; black, when polished.	6′ to 8′ ...	1½″ to 2″ ...	Fit for fine pillars, excellently suited for carving and making figures.
	Kyathenahally ...				
Pot stone ...	Pot stone	Fine grained, heavy, soft, of greyish colour.	4′ to 6′ ...	2′ to 3′ ...	Fit for carving figures; scrolls, can be fixed in lathes; balustrades, vessels and ink stands are made.

All these stones can be sawn into thick slabs in machine and for panels. The cost of making pillars out of these stones, ranges from Rs. 4 to Rs. 8.

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DESCRIPTION OF PLATES.

PLATE I.

STONE CARVING WORK.

Fig. 1 Sculptors at work at the Mysore new Palace. Some are lifting heavy stones for removal to their intended positions; some chiselling them; others are carving, etc.

INLAYING WORK.

Fig. 2. The group consists of sculptors engaged in preparing articles for inlaying work. Marbles are chiefly used for this kind of work, and all the men are working at and preparing them for the insertion of the coloured slabs according to designs. Some are cutting thin coloured slabs to the required sizes and shapes, with a revolving saw fixed to a bow; others are either filing these thin slabs to make them thinner and finer, or are polishing the surfaces, &c. (New Palace, Mysore.)

PLATE II.

STONE CARVING WORK.

Fig. 1.—A sculptor at Kothapeta, Amalapur Taluk, Godavari District.

Fig. 2.—A smith setting precious stones in a jewel, Kothapeta, Amalapur Taluk, Godavari District.

Fig. 3.—Stone carving implements used by a Muhammadan sculptor at Peddamudiyam, Cuddapah District. (1 and 2—hammers; a Hindu level; 4 to 15, chisels of different shapes and sizes; a Hindu set square, or a right angle.)

PLATE III.

ARTICLES AND INSTRUMENTS FROM DIFFERENT PLACES.

Coimbatore.

Figs. 1 and 2.—Pointed tools.
Figs. 3 and 4.—Flat edged tools.
Figs. 5 and 6.—Hammers.
Fig. 7.—Bellows in a furnace.
Fig. 8.—Greyish soapstone saucer lamp.
Figs. 9 and 10.—Greyish soapstone utensils.
Fig. 11.—Stone cornice.

Madras.

Figs. 12 to 26.—Chisels of different shapes and sizes.
Figs. 27 and 28.—Hammers.
Figs. 29 and 30.—Compasses.
Figs. 31 to 33.—Files.

Sydapuram, Nellore District

Figs. 34 and 35.—Chisels.
Fig. 36.—Hammer.
Fig. 37.—Section of the shape of a vessel.

PLATE IV.

Fig. 1.—Base in a Mandapam, Natarājā temple, Chidambaram, South Arcot District.
Fig. 2.—Base of the temple near a tomb at Waltair. (Sandstone).
Fig. 3.—A doorway—New temple, Tadpatri.
Figs. 4 and 5.—Portions of a doorway—Temple near a tomb, Waltair.

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PLATE V.

Fig. 1.—An enlarged view of the lintel of the doorway, Plate IV, Figure 3.
Fig. 2.—A portion of a doorway, temple near a tomb, Waltair.
Fig. 3.—The main entrance to the new temple, Tadpatri.

PLATE VI.

Fig. 1.—A doorway (sandstone)—Temple near a tomb, Waltair.
Figs. 2 and 3.—*Dvārakanyakās* or female Door-keepers. New temple, Tadpatri.
Fig. 4.—Jamb of a doorway—New temple, Prodattoor.

PLATE VII.

Figs. 1 to 5.—Details from the jamb of a doorway in the main entrance, Plate V, Figure 3.
Fig. 6.—Jamb of a doorway, Plate IV, Figure 3.

PLATE VIII.

Figs. 1 and 7.—Details from a jamb of a doorway, Plate VI, Figure 4.
Figs. 2, 6, 8 and 9.—Figures and details from a jamb of a doorway in the main entrance, Plate V, Figure 3.
Fig. 3.—Details from the jamb of the doorway, Plate IV, Figure 3.
Figs. 4 and 5.—Details from a pillar—New temple, Prodattoor, Cuddapah District.

PLATE IX.

Fig. 1.—A pilaster—Temple near a tomb, Waltair.
Fig. 2.—Details from a jamb of the doorway—Plate VI, Figure 4.
Fig. 3.—Details from a jamb—Temple, Tiruvallur, Tanjore District.
Figs. 4 and 5.—*Daśavatārs* in the archway of the second entrance to Plate V, Figure 3.
Fig. 6.—*Nandi Mandapam*—Ékāmbarēśvaraśvāmi's temple premises, Conjeevaram.

PLATE X.

Fig. 1.—An octagonal pillar—Tomb near a temple, Waltair.
Fig. 2.—A monolithic pillar with eight pilasters cut on it—Nataraja temple, second *prakaram*, Chidambaram.
Fig. 3.—An octagonal pillar—New temple, Tadpatri.
Figs. 4 and 6.—Pillars at the new *Shaṇmuga Vilās Mandapam*, Trichendur, Tinnevelly District.
Fig. 5.—A pillar—New temple, Prodattoor.

PLATE XI.

Fig. 1.—A monolithic pillar with three sub-pillars cut on it, at the new *Shaṇmuga Vilās Mandapam*, Trichendur, Tinnevelly District.
Fig. 2.—A pillar and a perforated window in a Nattukkottai Chetty's *Chatram* at Trichendur, Tinnevelly District.
Fig. 3.—An octagonal pillar—New temple, Tadpatri.
Figs. 4, 5 and 8.—Captials of pillars—The Senate Hall, Madras.
Figs. 6, 7 and 11.—Capitals of pillars—New temple, Prodattoor.
Figs. 9 and 10.—Capitals of pillars—New temple, Tadpatri.

PLATE XII.

Figs. 1 to 4.—Bases of pillars—New temple, Tadpatri.
Fig. 5.—Base of a pillar—New temple, Prodattoor.

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PLATE XIII.

Figs. 1 and 2.—Bases of pillars—New temple, Prodattoor.
Figs. 3 to 6.—Details from pillars—New temple, Tadpatri.

PLATE XIV.

Figs. 1 to 4.—Details from pillars—New temple, Tadpatri.
Fig. 5.—A *yāḷi* pillar bracket—Rajampet, Cuddapah District.
Fig. 6.—*Yāḷi* and other details, crowning a lintel—New temple, Prodattoor.
Fig. 7.—The end of a beam in the ceiling of the main entrance, Plate V, Figure 3.
Fig. 8.—A beam in a *Mandapam*, Nellayappar temple, Tinnevelly.

PLATE XV.

Figs. 1 and 2.—Beams in the ceiling of the main entrance, Plate V, Figure 3.
Fig. 3.—The pinnacles over the gateway of the old Museum buildings at Nungambakam, Madras.
Fig. 4.—The figures of *Bhūta* and *Nandi*, in the parapet wall, around the *Ékāmbarēśvara* tree (Mango) in *Ékāmbarēśvaraśvāmi* temple, Conjeevaram.
Fig. 5.—A perforated window—New buildings, adjacent to the Chepauk Palace, Madras.
Figs. 6 and 7.—Perforated panels, Lawrence Asylum Press, New buildings.
Fig. 8.—A perforated panel, in the Chepauk Palace, Madras.
Fig. 9.—The enclosure walls of a well in the *Nataraja* temple at Chidambaram.

PLATE XVI.

Fig. 1.—A panel in a pedestal, (*Thadā* stone), at the old Museum buildings, Nungambakam, Madras.
Fig. 2.—Base of a lamp post—Chepauk Palace, Madras.
Fig. 3.—A pedestal at the main gate, Veterinary Hospital, Vepery, Madras.
Figs. 4 and 5.—The bases of crosses, Purasavakkam Cemetery.
Fig. 6.—Two cut elephants at a stone built tank, Peddamudiyam, Cuddapah District.

PLATE XVII.

Figs. 1 to 3 and 10.—Images of deities in the new *Ranganādhasvāmi* temple, Kōmallēśvarampet, Madras.
Figs. 4 to 6.—The images of *Rāmā*, *Lakshmaṇā* and *Sītā*—Tadpatri.
Figs. 7 to 9.—Images of deities, *Dakshināmūrti*, *Bairavaśvāmi* and *Kōlpulināinar*, at Tirunātiatangudi temple, Tanjore District.

PLATE XVIII.

Figs. 1 and 2.—Images of *Garudā* and *Brahmā* in the new *Ranganādhasvāmi* temple, Kōmallēśvarampet, Madras.
Figs. 3, 5 and 10.—Images of a *Lingam*, *Nandi* and *Áñyanēya*—Harpanahalli, Bellary District.
Figs. 4 and 7 to 9.—Images of *Krishnā* and Figure 6—of a *Rishi*—(all marble)—in possession of Messrs. Fenn and Co., Madras.

PLATE XIX

Figs. 1 and 2.—Images of *Vishnu* and *Krishṇā* in charge of private individuals—*vide* Plate XVIII, Figure 6.
Fig. 3.—Inkstand—Harpanahalli, Bellary District.
Figs. 4 to 9.—Paper weights of different shapes, all of sandstone—Waltair.
Figs. 10 and 11.—Two pots of soapstone from Harpanahalli, Bellary District.
Figs. 12, 13 and 18.—Small toys, *Kunkuma Bharanee*, *Kātika Kāyee* and snuff box, from Vinukonda Taluk, Guntur District.
Figs. 14 to 17.—Domestic articles, such as grinders and mortars and pestles from Coorg.
Fig. 19.—Black polished stone ruler, Tadpatri.
Fig. 20.—A stone platter, Tadpatri.
Fig. 21.—A mortar with a pestle (marble), Tadpatri.

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PLATE XX.

Figs. 1 and 2.—Crystal *Lingam* and *Gaṇēśa* from Settipolliem, Coimbatore District.
Figs. 3 to 6.—Seals from the South Canara District.
Figs. 7 and 8.—Chess pieces from Vinukonda taluk, Guntur District.
Figs. 9 to 11 and 13.—Tomb stones and crosses at Cemeteries near Thenampet and at Purasavakkam, Madras. (Figure 13 is made of marble).
Figs. 12 and 14.—Crosses (Marble)—Fenn and Co., Madras.

PLATE XXI.

Fig. 1.—Marble cross—Cemetery, San Thomé, Madras.
Figs. 2 and 7.—Marble crosses, St. Andrew's Cemetery, Madras.
Figs. 3 and 6.—Marble crosses—Cemetery, Thenampet, Madras.
Figs. 4 and 5.—Marble crosses at Cemeteries near Thenampet and at Purasavakkam, Madras.

PLATE XXII.

Mysore.

Fig. 1.—A base of a pillar, supporting the arch of a porch in front of the palace. It is about two and a half feet in height, and of about the same diameter. In the vacant niche, it is intended to put an image.
Fig. 2.—Two quadruple pillars, florally carved. The stone used is known as Kaithanahalli, from a village of that name. The pillars are about seven and a half feet high.
Fig. 3.—A capital, with three sculptured images, reproduced from one of Ravivarma's pictures.
Fig. 4.—A marble pillar base. The diameter of the base is about a foot.
Fig. 5.—Another portion intended to be added to the above pillar.
Fig. 6.—A capital of one of the pillars, with carved peacocks.

PLATE XXIII.

Fig. 1.—A soapstone capital of one of the pillars, with the images of *Sarasvati* and the sacred geese (*hamsas*).
Fig. 2.—A capital, similar to that mentioned above, with two female figures sculptured in the centre, and the trunk of an elephant, on the bracket.
Fig. 3.—A similar capital, with the images of *Śakuntala* and an *apsara* woman in the centre, and *ghandarvās* on the sides.
Fig. 4.—A soapstone *Gaṇēśa*, intended to be inserted in one of the niches.
Figs. 5 to 9.—Soapstone balustrade pillars.

PLATE XXIV.

Fig. 1.—A panel with *Śita Svayamvaram* (marriage of *Śita*). The stone used is known as Thiruvekere.
Fig. 2.—A soapstone panel with the image of *Vishṇu.*
Fig. 3.—Thiruvekere stone slab with the image of *Chāmundi.*
Fig. 4.—A soapstone panel with the figure of *Krishṇā.*
Fig. 5.—Thiruvekere stone, with the image of *Ranganādhā.*
Fig. 6.—Thiruvekere stone panel, with the image of *Rukmaṇi Svayamvaram* (marriage of *Rukmani*).

PLATE XXV.

Figs. 1 to 5.—Soapstone floral panels with the figures of birds and a lion.
Figs. 6 to 9.—Are soapstone panels on pilasters.

PLATE XXVI.

Figs. 1 to 3.—Soapstone panels, with female figures.
Fig. 4.—A flat pointed arch, made of soapstone.
Figs. 5 to 7.—Soapstone bosses.
Fig. 8.—*Aājaneya* (Kaithanahalli stone).
Fig. 9. —A pendant (soapstone).

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PLATE XXVII.

Fig. 1.—Part of a cusped arcade.
Fig. 2.—A balcony.

PLATE XXVIII.

Figs. 1 to 4.—Cornices with carvings of peacocks, birds with scrolls, antelopes and elephants.
Fig. 5.—A pilaster.
Figs. 6 to 8.—*Kalaśams*, crown heads or finials.

PLATE XXIX.

Figs. 1, 2 and 4 to 6.—Alabaster boxes.
Fig. 3.—*Krishṇā* (marble).
Figs. 7 to 12.—Birds (soapstone).

PLATE XXX.

Fig. 1.—Yāḷi.
Fig. 2.—A memorandum frame (made of several kinds of stone).
Fig. 3.—Inkstand (soapstone).

INLAID WORK (MARBLE).

Fig. 4.—Panel on an archway.
Figs. 5 and 6.—Slabs.

PLATE XXXI.

INLAID WORK.

Fig. 1.—Panel on an arch.
Fig. 2.—An oval slab.
Figs. 3 and 4.—Sides or spandrels of an arch.
Figs. 5 and 6.—Panels.
Figs. 7, 8 and 9.—Trays.

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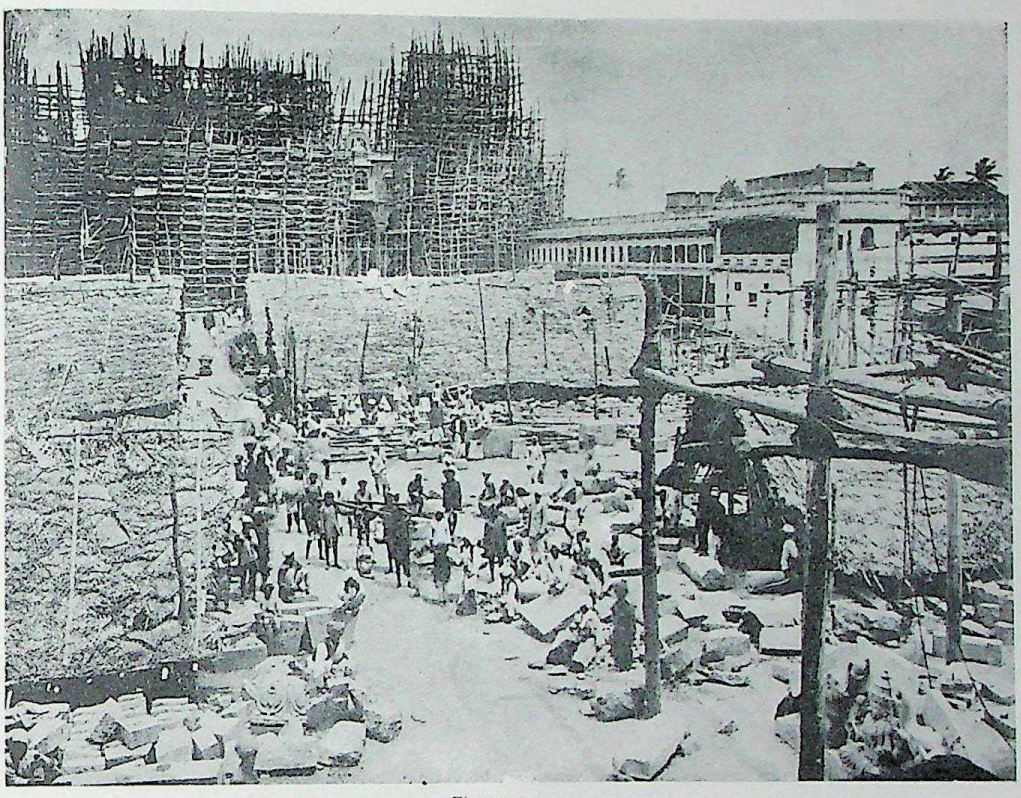

Fig. 1 .

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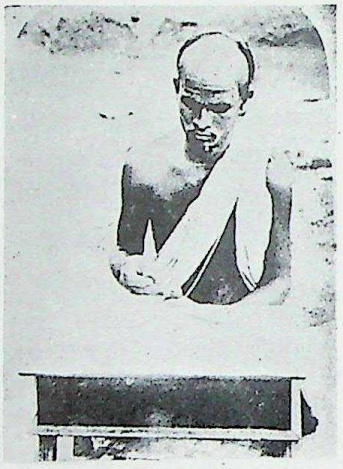

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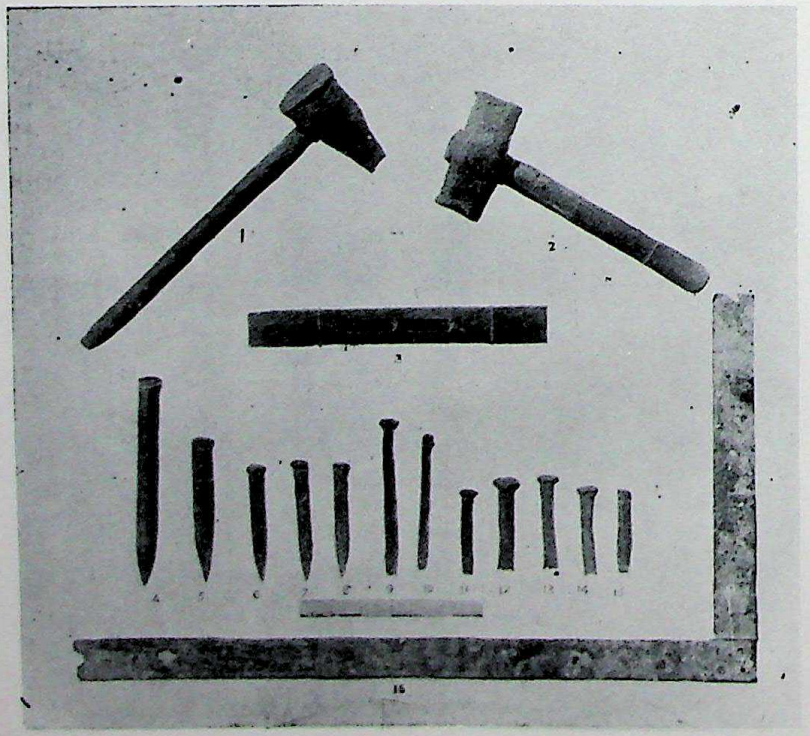

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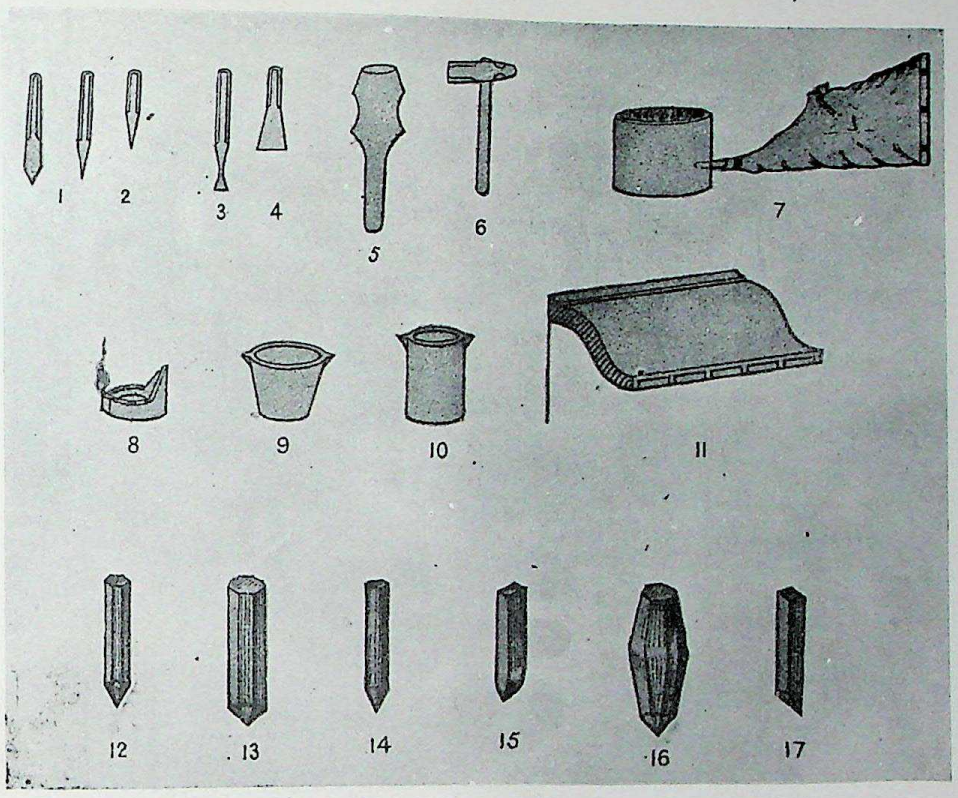

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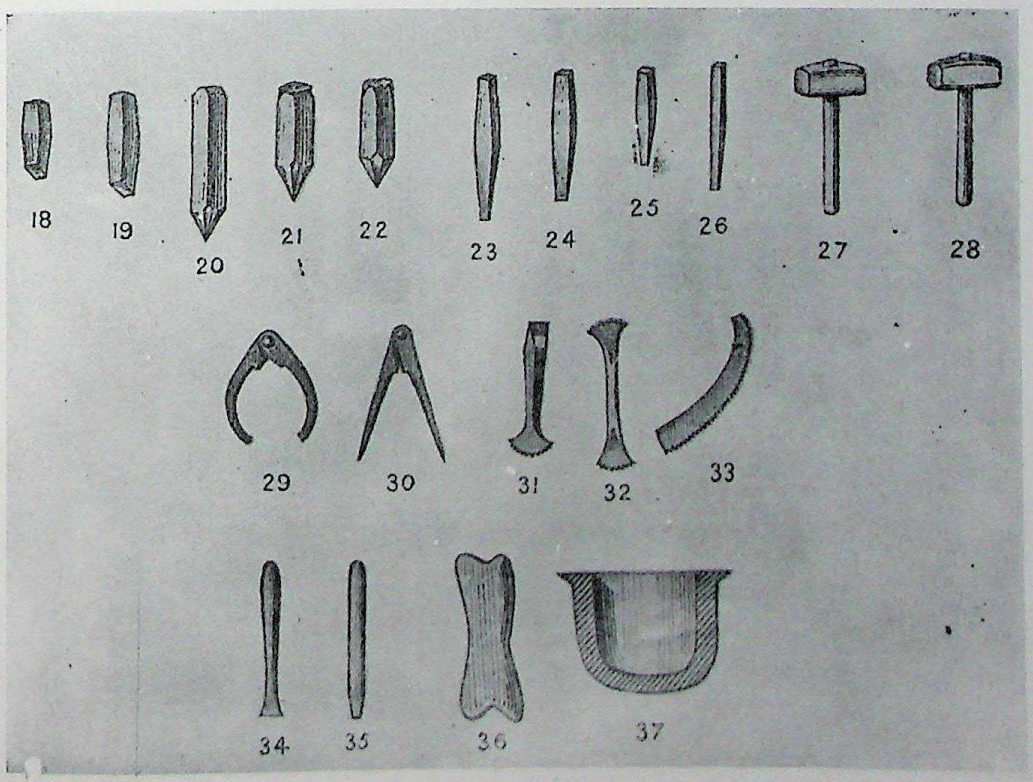

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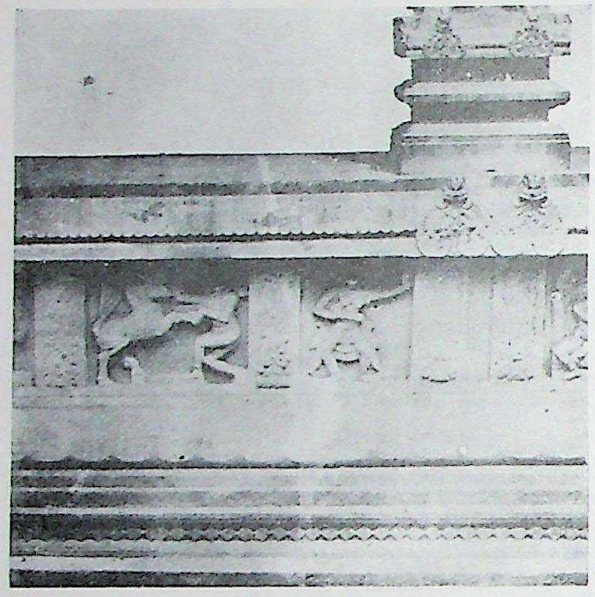

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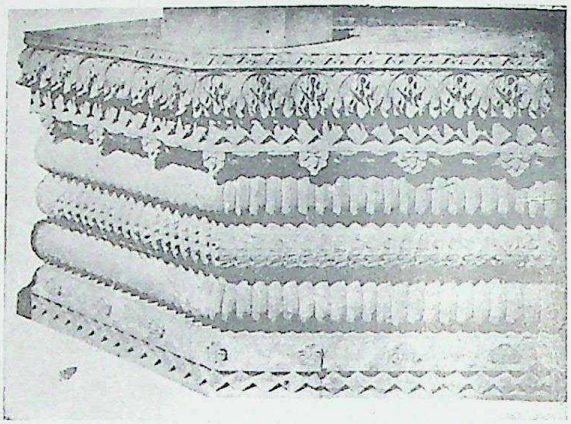

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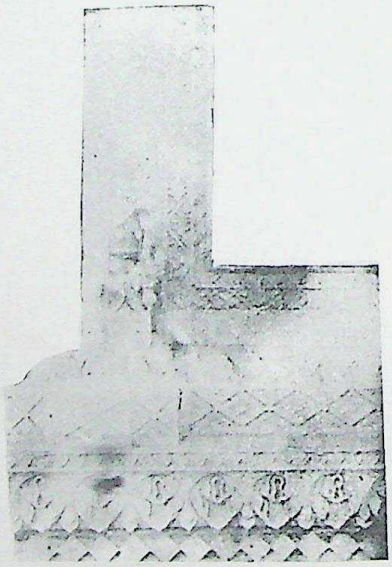

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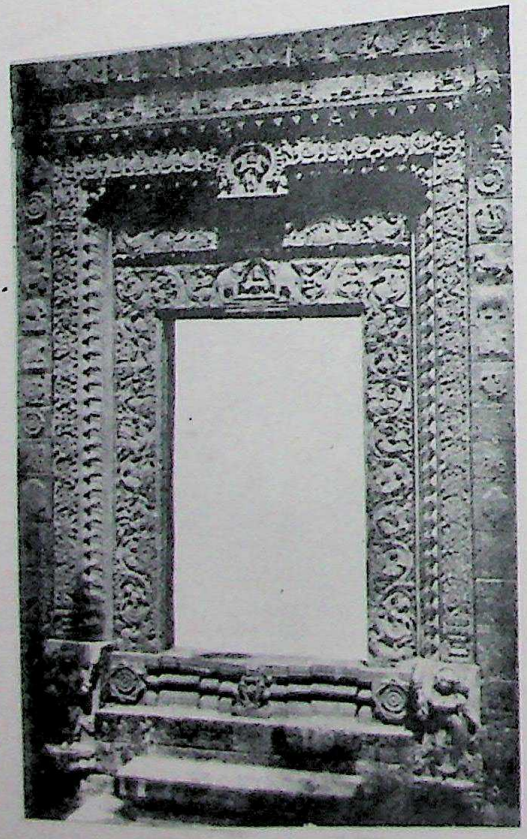

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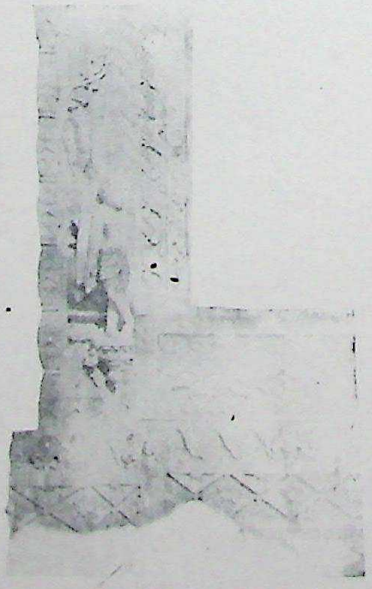

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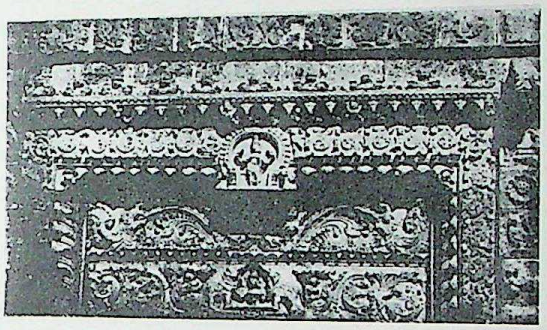

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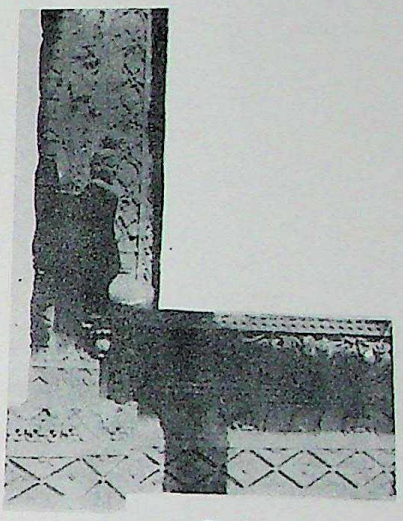

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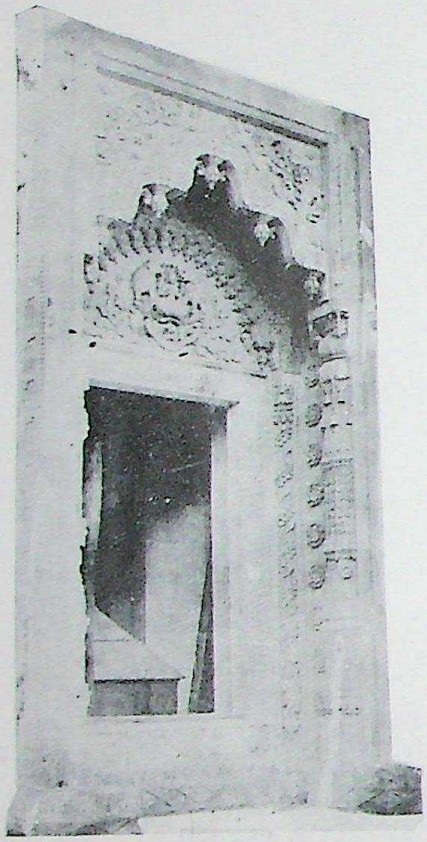

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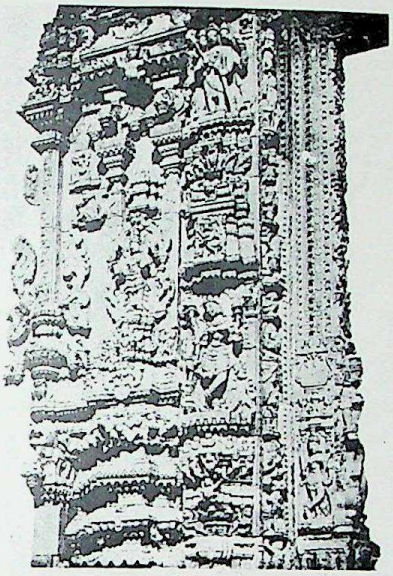

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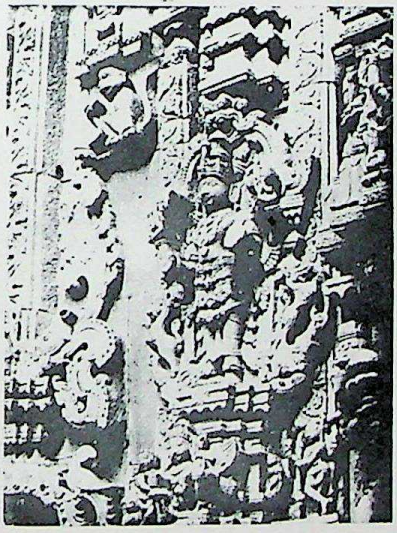

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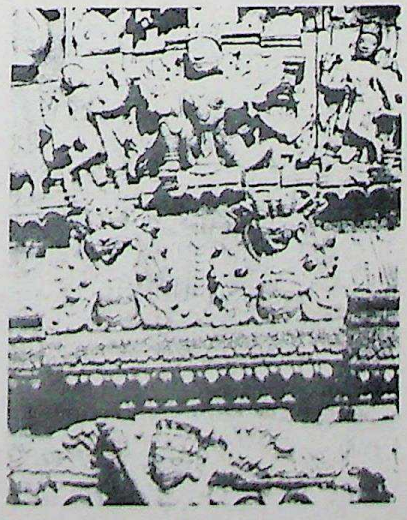

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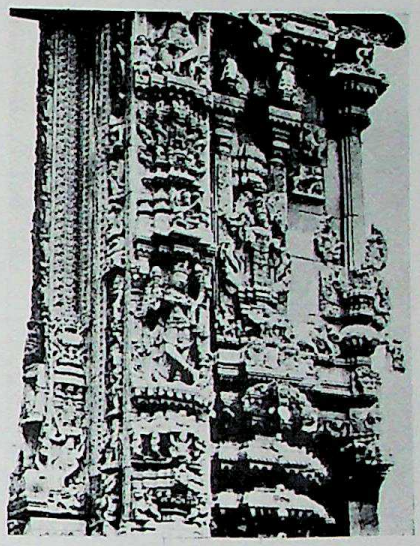

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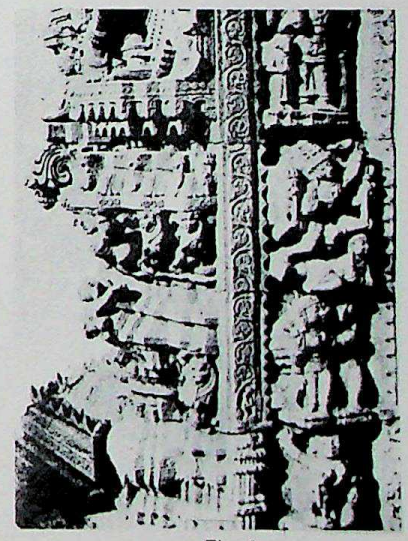

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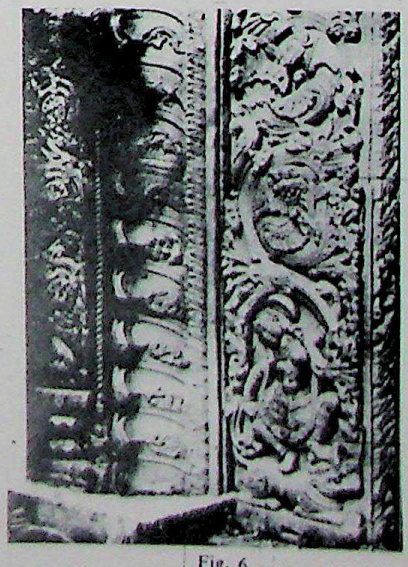

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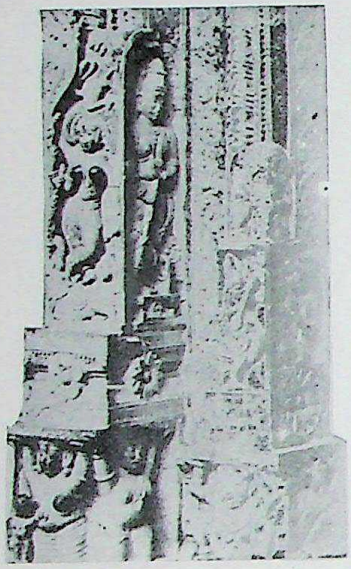

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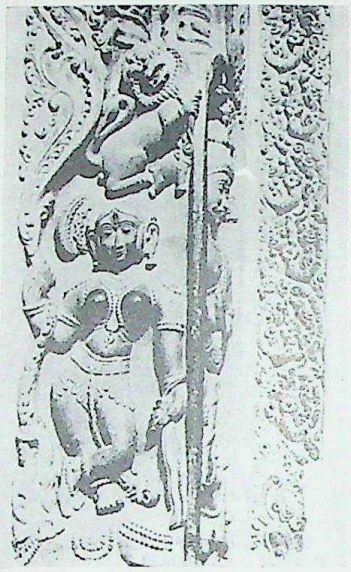

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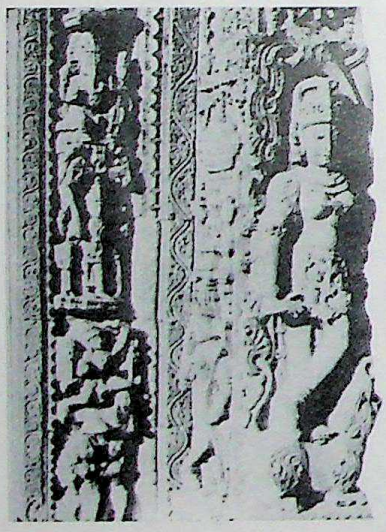

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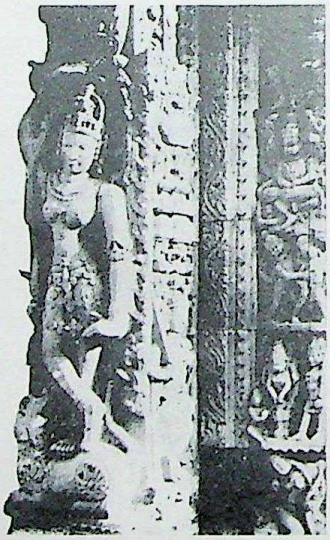

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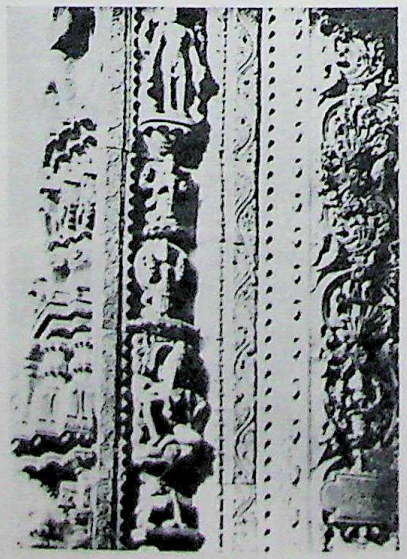

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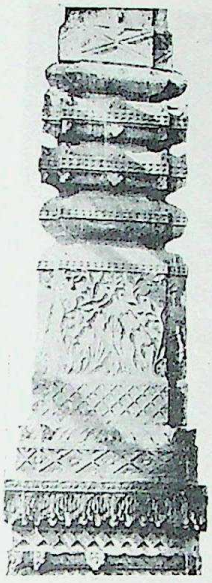

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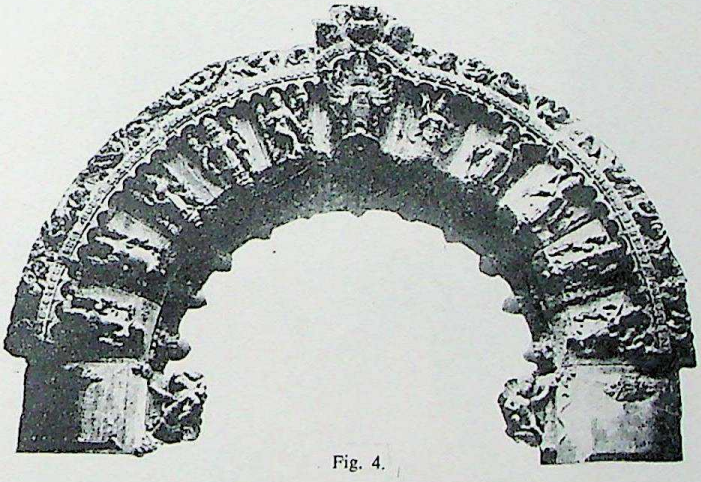

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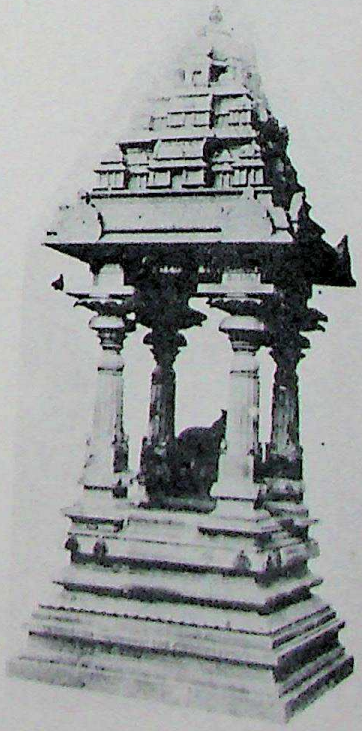

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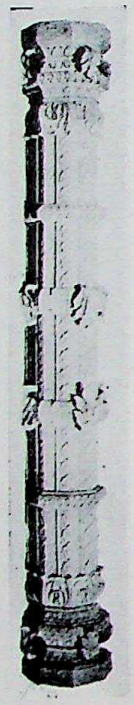

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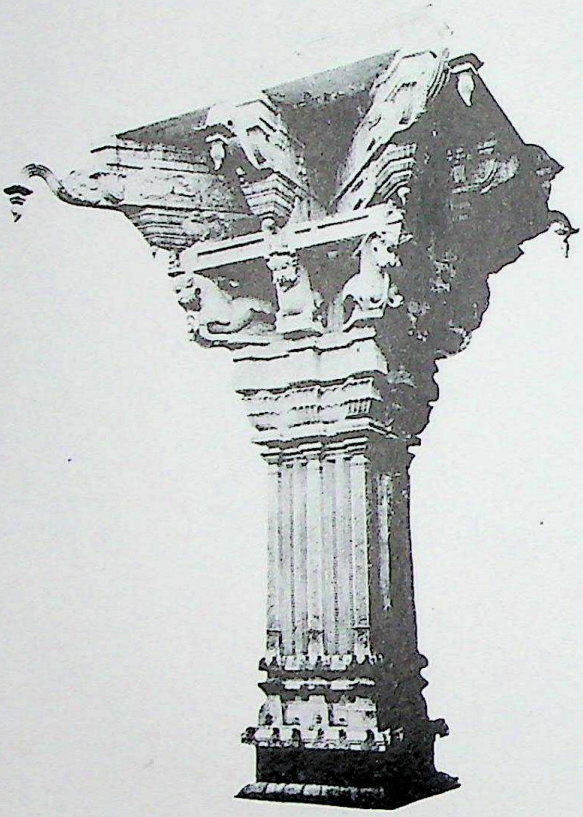

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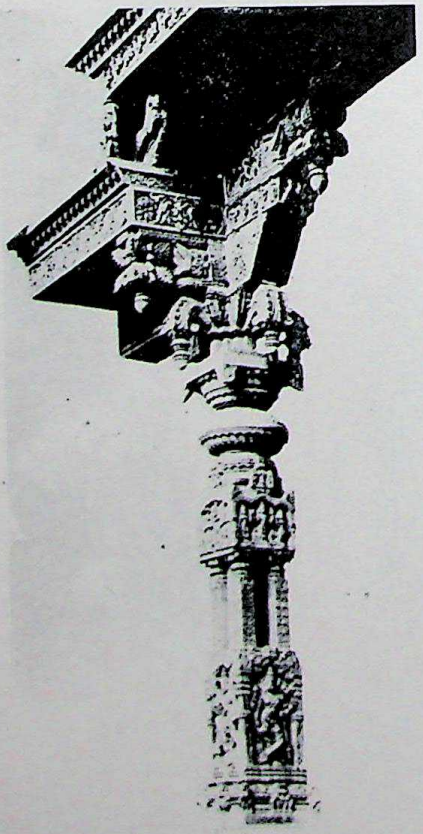

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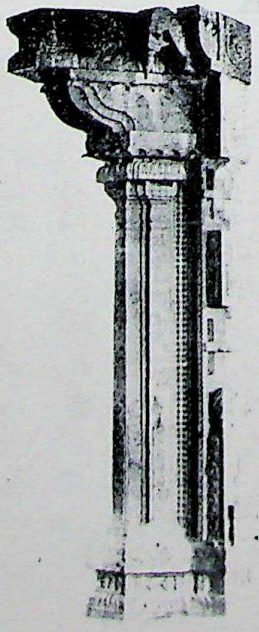

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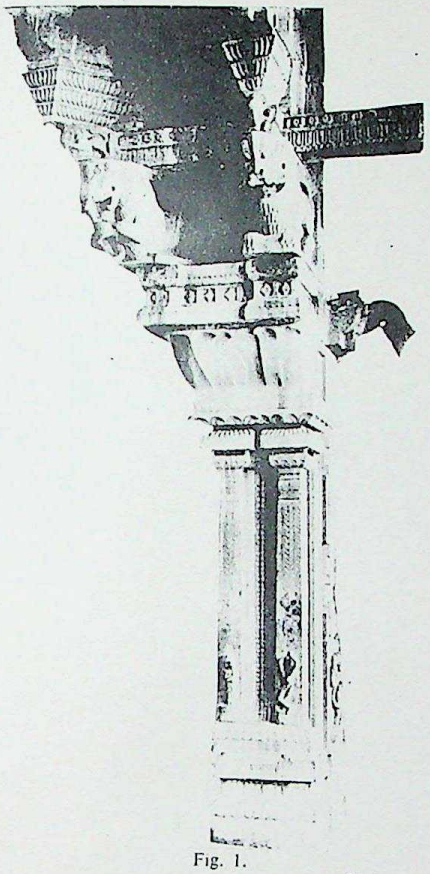

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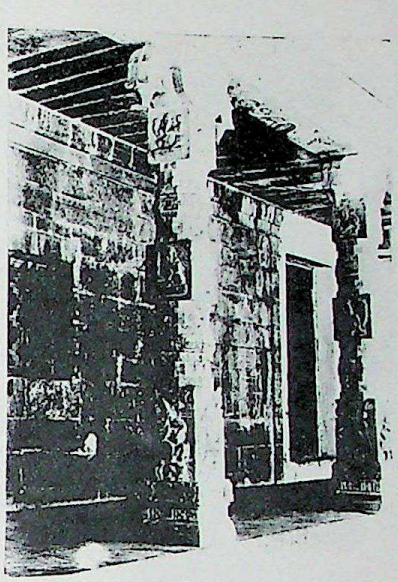

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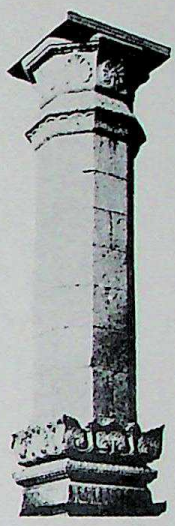

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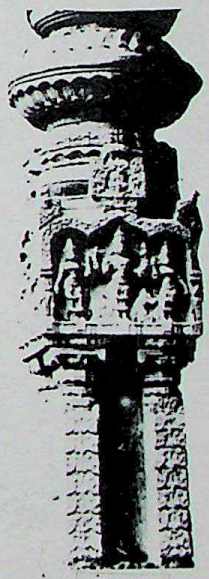

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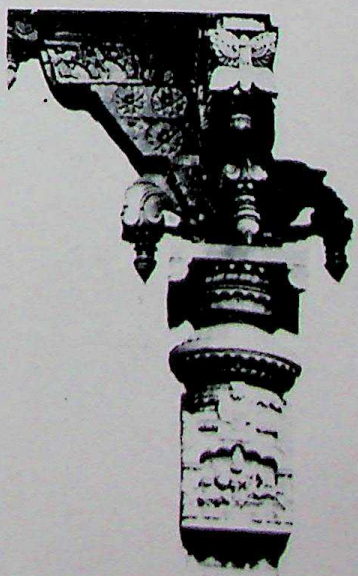

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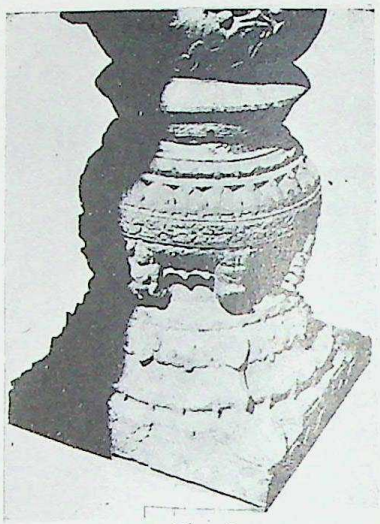

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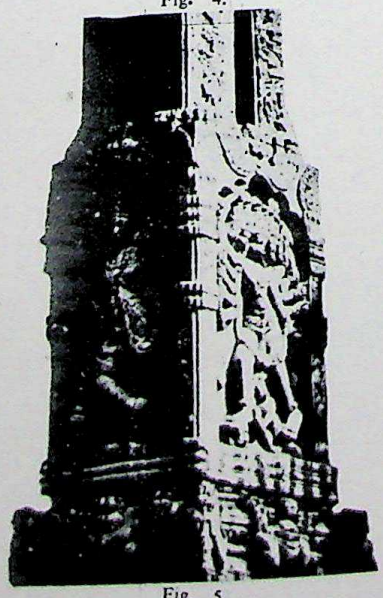

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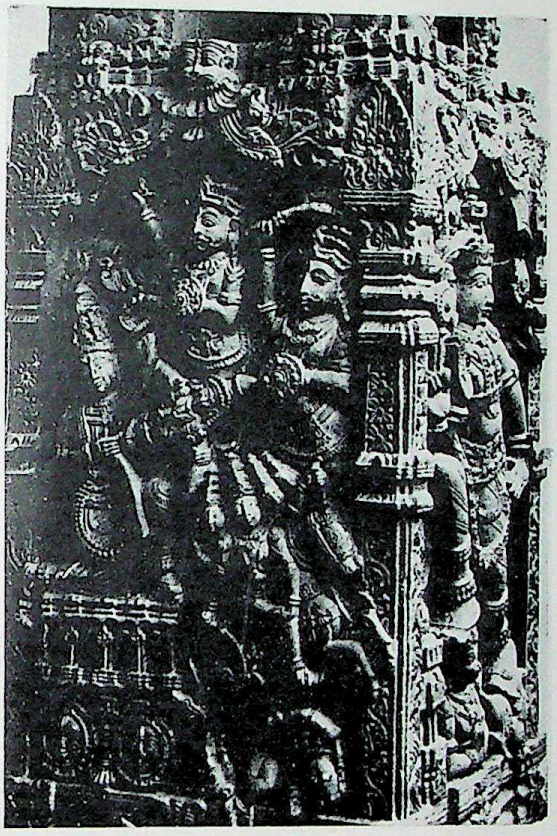

Fig. 1.

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Fig. 1.

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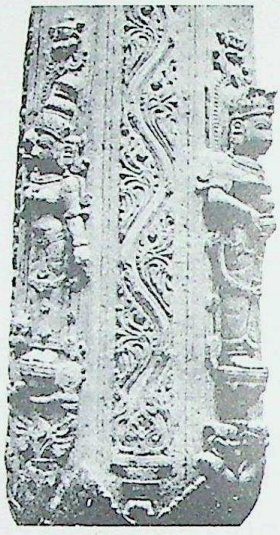

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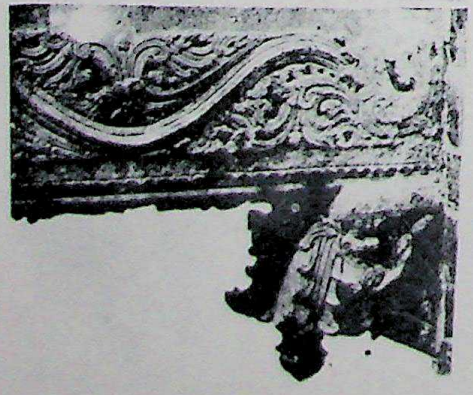

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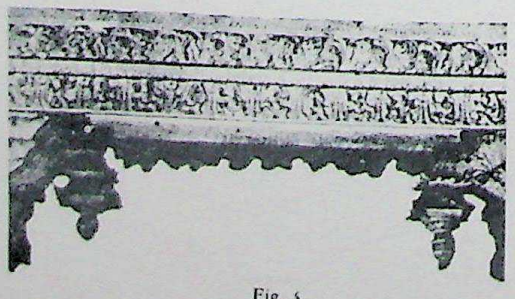

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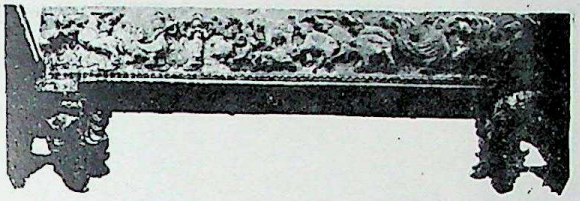

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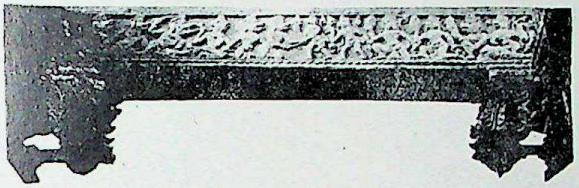

Fig. 2.

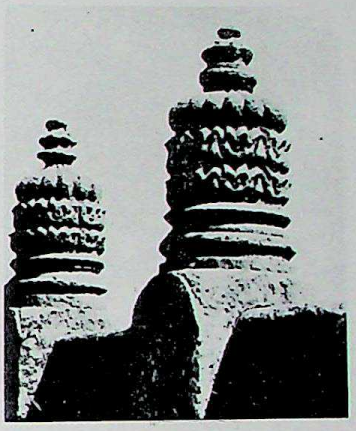

Fig. 3.

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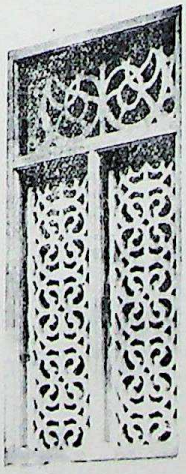

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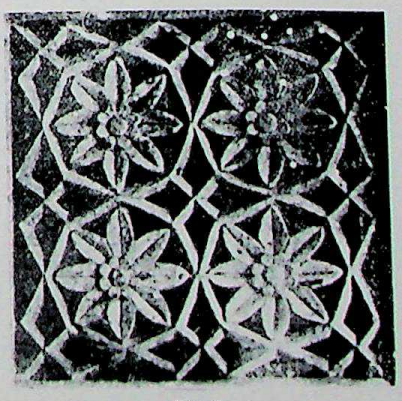

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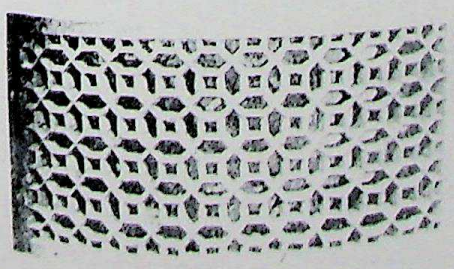

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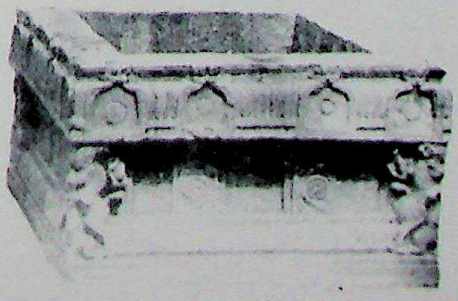

Fig. 9

CC-0. Agamnigam Digital Presevation Foundation, Chandigarh

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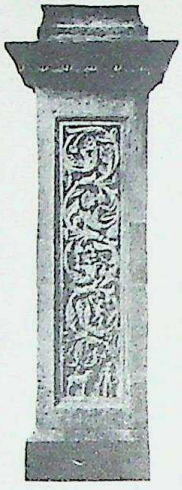

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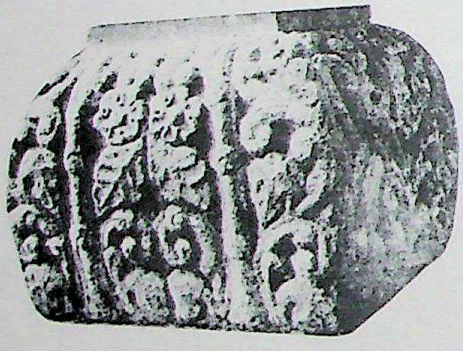

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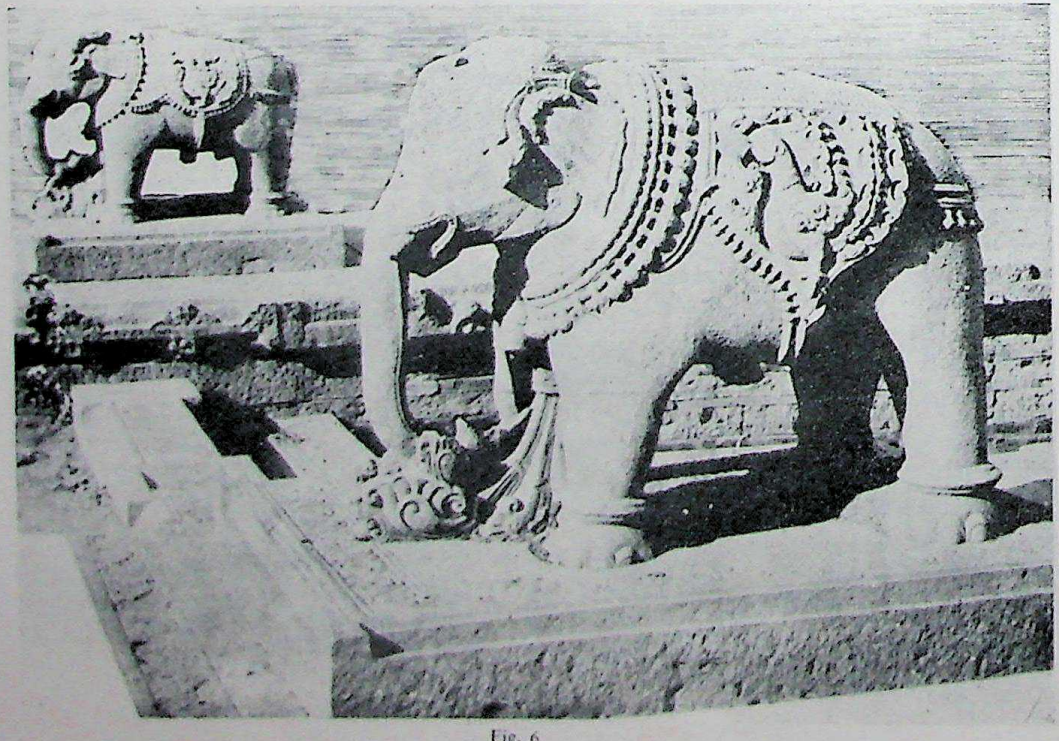

Fig. 6

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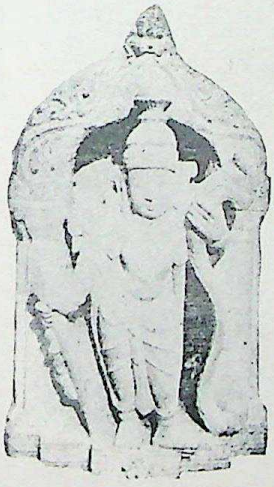

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CC-0. Agamnigam Digital Presevation Foundation, Chandigarh

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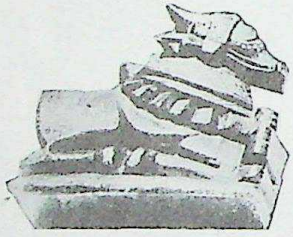

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CC-0. Agamnigam Digital Presevation Foundation, Chandigarh

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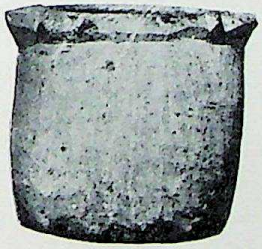

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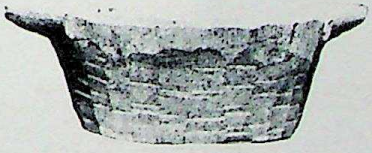

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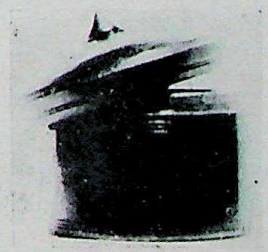

Fig. 12.

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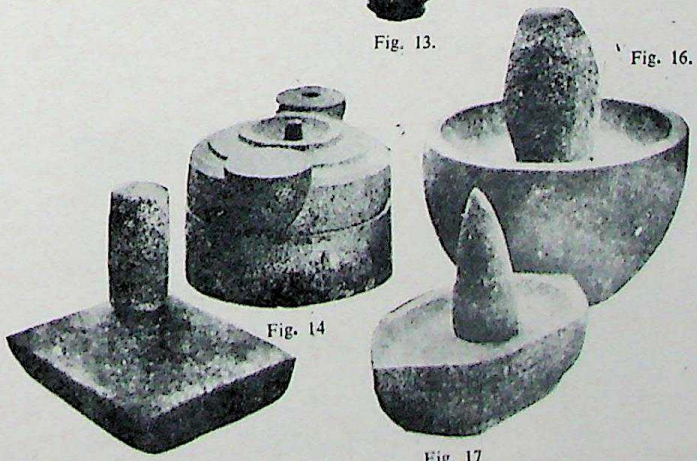

Fig. 14

Fig. 15.

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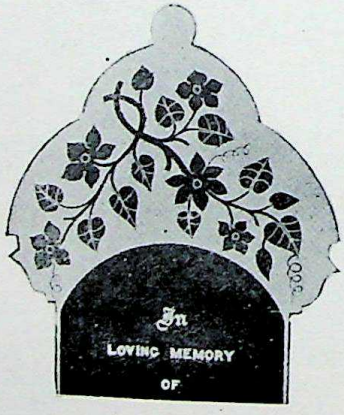

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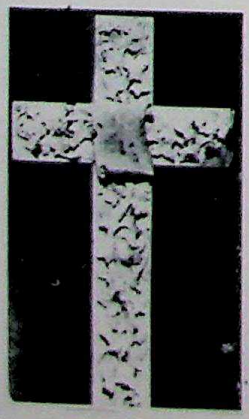

Fig. 12.

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Fig. 14.

CC-0. Agamnigam Digital Presevation Foundation, Chandigarh

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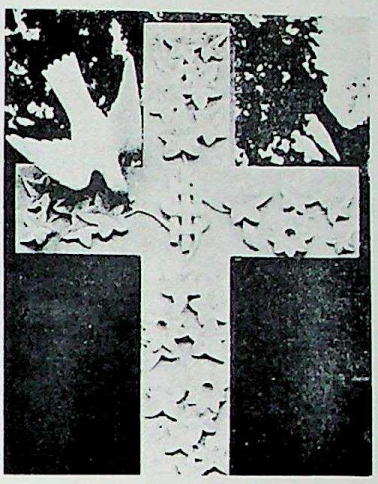

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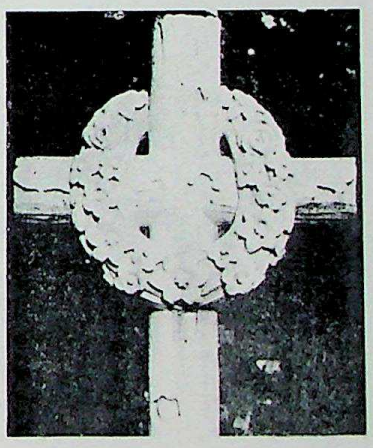

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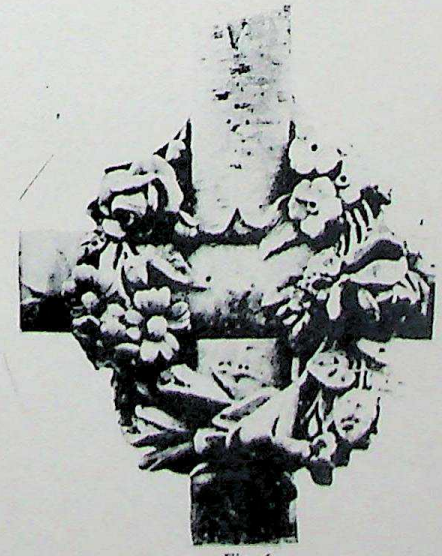

Fig. 6

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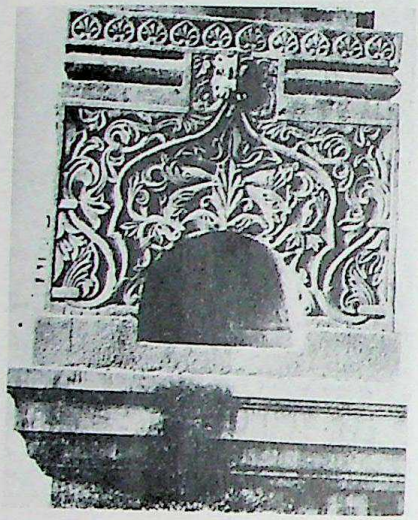
CC-0. Agamnigam Digital Presevation Foundation, Chandigarh



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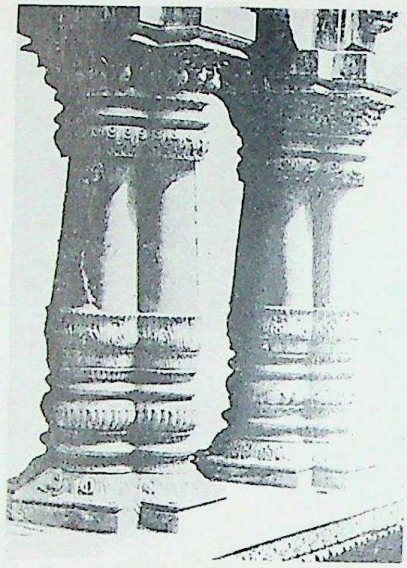

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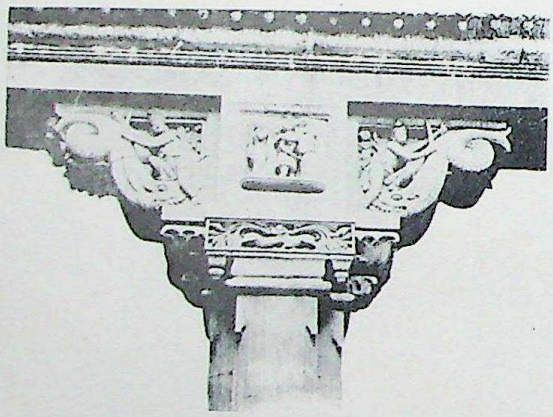

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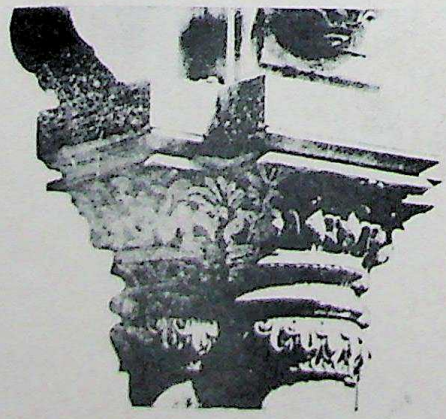

Fig. 6

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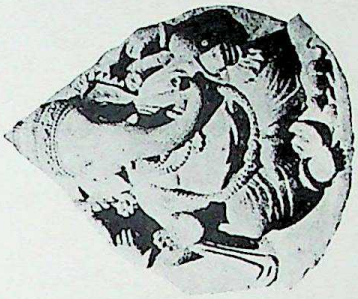

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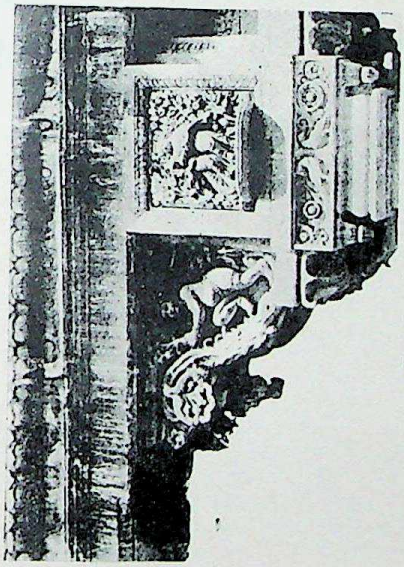

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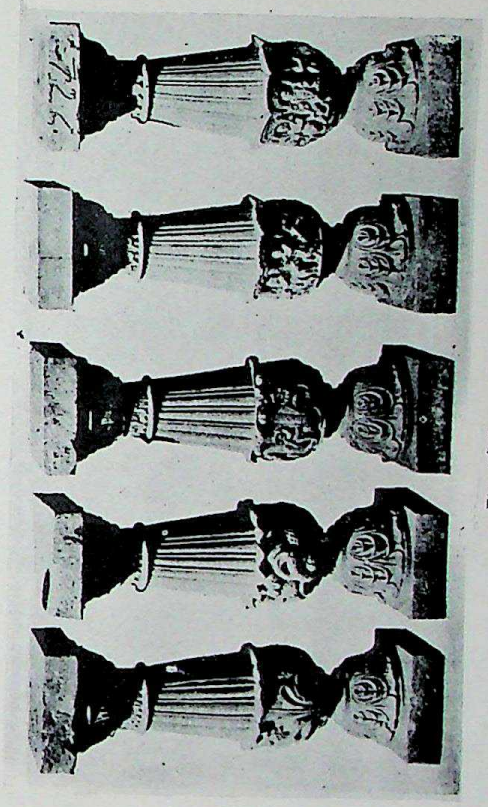

Fig. 5 & 9.

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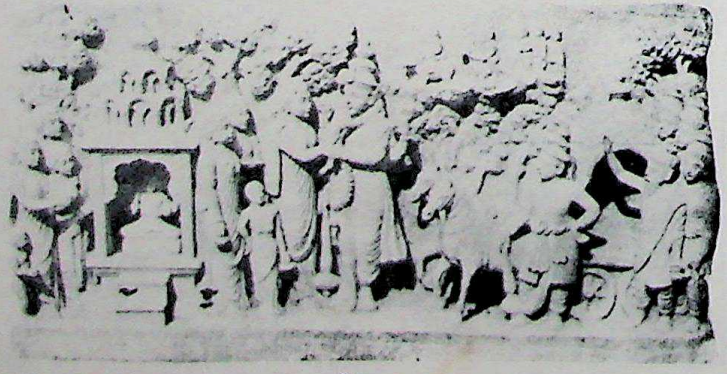

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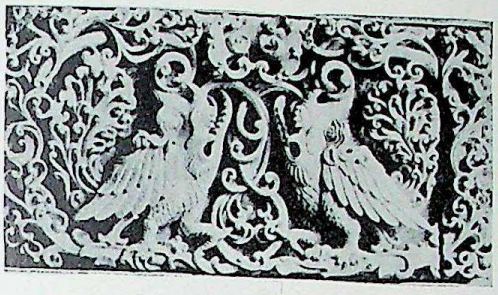

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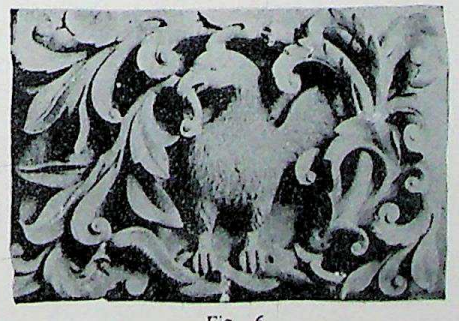

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CC-0. Agamnigam Digital Presevation Foundation, Chandigarh

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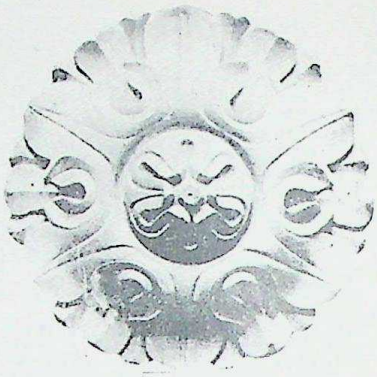

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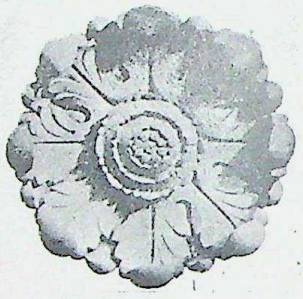

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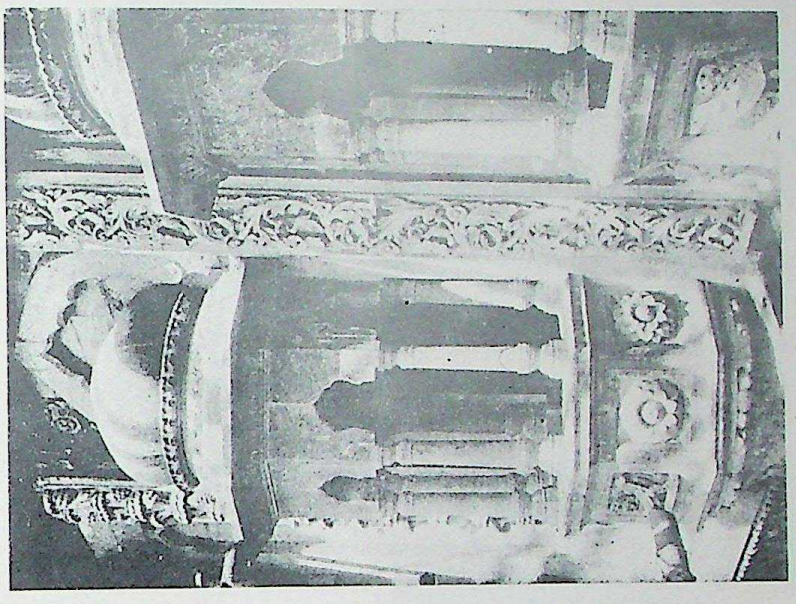

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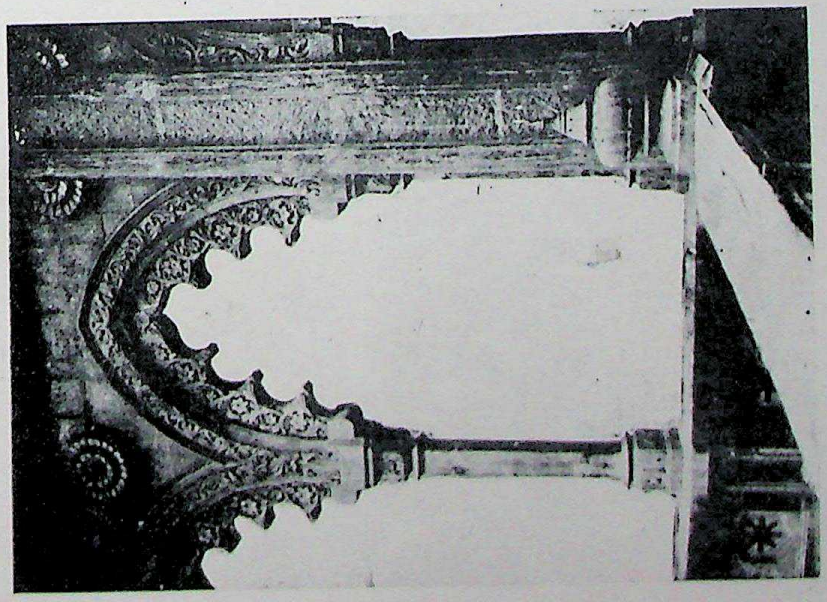
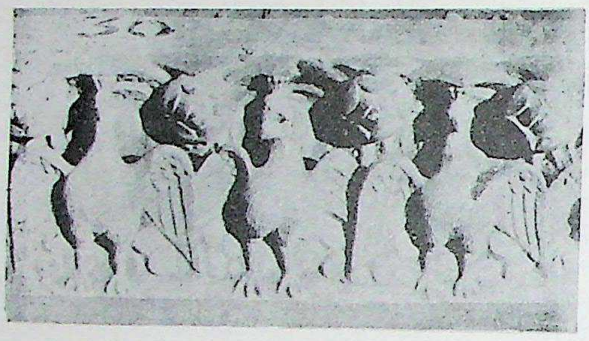


Fig. 1.

CC-0. Agamnigam Digital Presevation Foundation, Chandigarh



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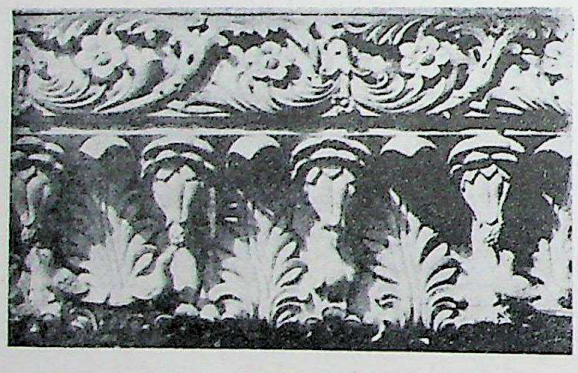

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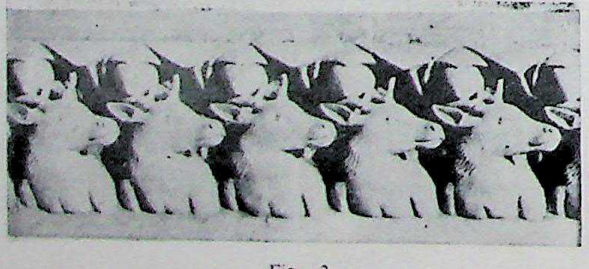

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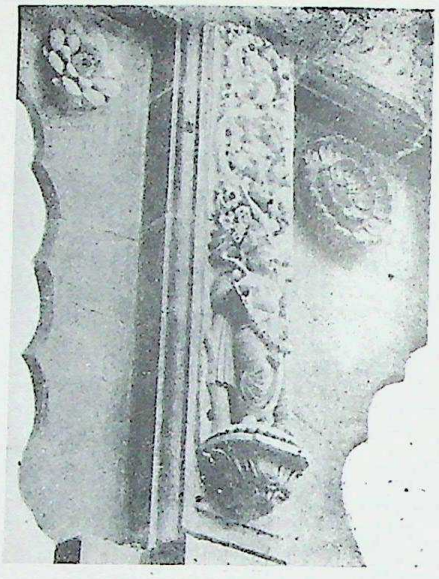

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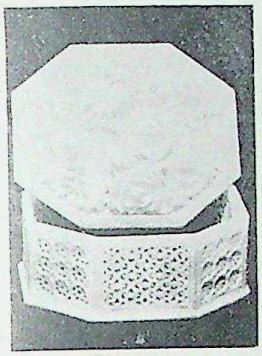
CC-0. Agamnigam Digital Presevation Foundation, Chandigarh



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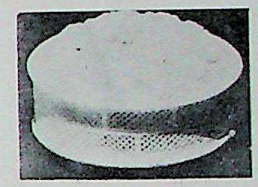

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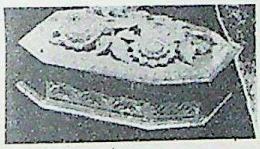

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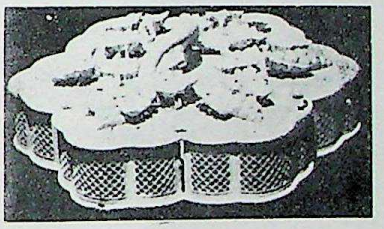

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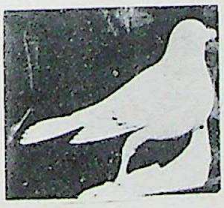

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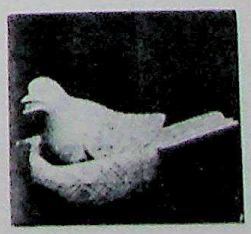
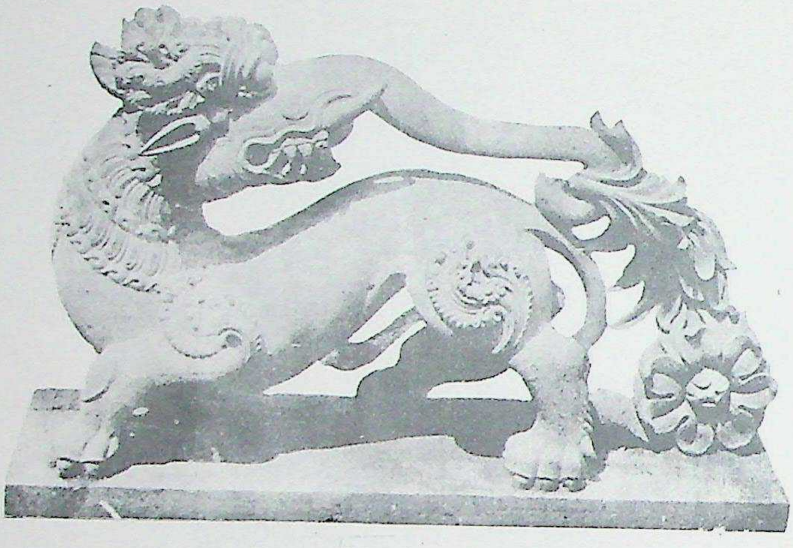


Fig. 12.

CC-0. Agamnigam Digital Presevation Foundation, Chandigarh



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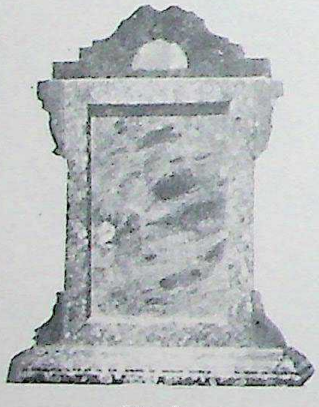

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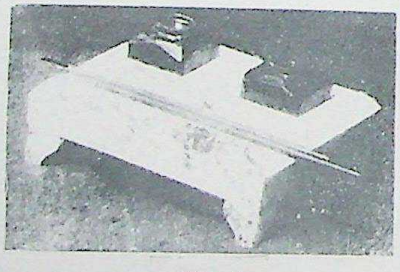

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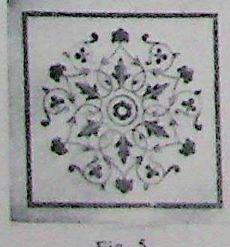

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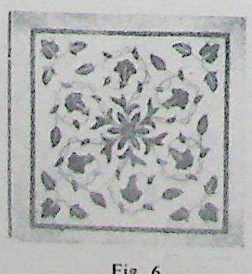

Fig. 6

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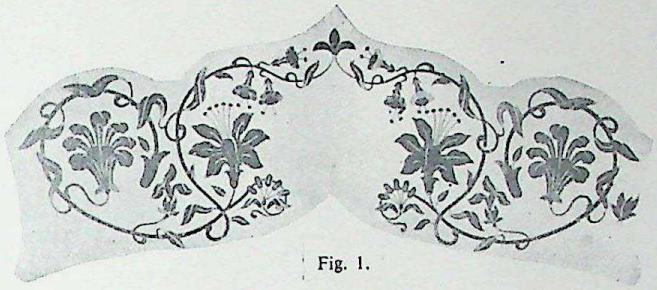
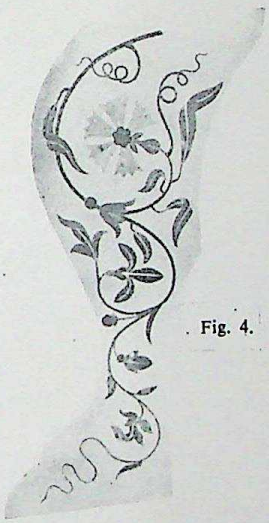


Fig. 1.

Fig. 2.

Fig. 3.



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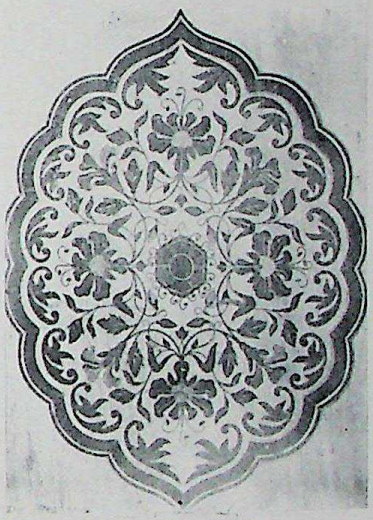


Fig. 5.

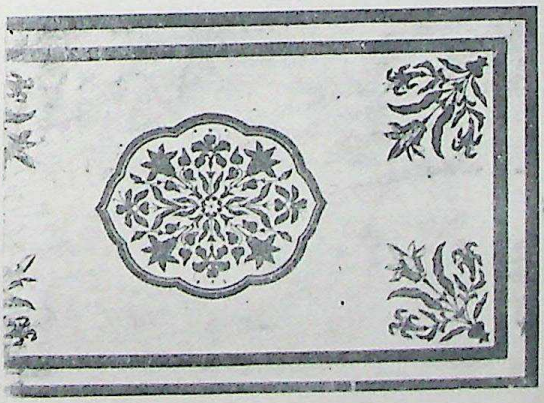
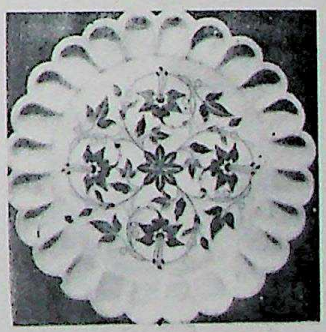


Fig. 6



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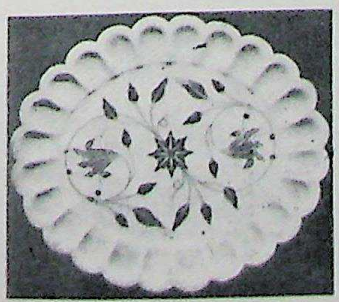

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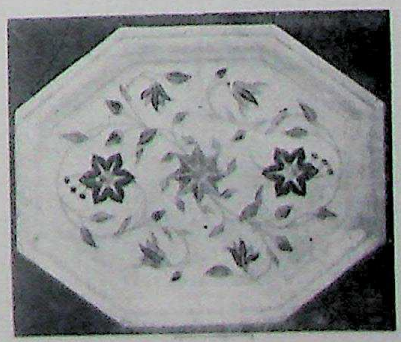

Fig. 9.

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A MONOGRAPH ON TANNING AND WORKING IN LEATHER IN THE MADRAS PRESIDENCY.

CHAPTER I.

HISTORY.

It is difficult now to obtain any information regarding tanning and leather-working when they were purely indigenous industries. Trichinopoly is said to have been a great centre of the tanning trade and from thence large numbers of sandals and shoes were sent out to various parts of the country. If we may judge by what is now done in remote districts where the village tanner is still uninfluenced by modern methods of procedure, it is probable that the indigenous industry was in an extremely primitive condition and that only very inferior kinds of leather were produced. Nevertheless, tanneries of considerable size must have existed to supply harness and saddlery for the enormous number of irregular troops and retainers which were kept under arms by the numerous Rajahs, Zamindars and petty chieftains, who formerly exercised more or less independent sovereign powers throughout the country. The requirements of the civil population were probably small and confined chiefly to leather-thongs and ropes for the harness of draft cattle, to water bags for the country mhote, and to vessels for holding oil and ghee.

The European methods of tanning hides were first introduced by the military authorities who established a tannery at Hoonsur for the purpose of manufacturing superior leather suitable for harness and other military equipment. Contemporaneously, a French Eurasian of Pondicherry named Charles de Susa introduced improvements in the native methods of preparing skins. He is said to have visited the Isle de Bourbon or Mauritius sometime in the forties and to have there acquired a practical knowledge of the French processes of tanning. On his return to Pondicherry about the end of the forties he started a tannery there and a little later he came to Madras to set up several small tanneries, the products of which were probably exported to England. At that date the supply of both hides and skins was greatly in excess of the demand and from the Trade Returns of 1846 it would appear that the raw hides exported from Madras were of the average value of 7 annas 8 pies each, whilst the raw skins were worth 3 annas 2 pies each. These were probably selected hides and skins as the value of the exported tanned goods was even less. The tale is told that when De Susa first came to Madras he made a contract with a Muhammadan tanner to supply him with goat skins for a number of years at

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Rs. 14 per 100. The skin dealer thought he had made a remarkably good bargain but eventually as the result of De Susa's enterprise, the price of skins rose so rapidly that being compelled to adhere to his contract he was soon ruined. De Susa introduced many important improvements in the native processes of tanning and he was probably the first tanner in this Presidency who succeeded in producing skins which on exposure to the air showed no tendency to that fawn red discolourisation which was previously one of the distinguishing features of country-tanned leathers. This important improvement was effected by immersing the tanned skins in a bath of myrabolams for two or three days after the ordinary tanning had been completed. With raw materials at such an exceedingly low price, with cheap labour, and with the comparatively small capital outlay which was necessary to establish a tannery, it is not surprising that the vastly improved tanned skins found a ready market in Europe and that the export trade which he started grew rapidly to considerable dimensions. Following De Susa this new tanning trade was at first largely in the hands of Eurasians but their lack of energy, improvidence and inferior business capacity enabled Muhammadan and native tanners to cut them out, so that at the present day there is scarcely a single tannery in this Presidency worked by Eurasians.

In the Report of the Madras Exhibition of 1855 it is stated—

"The manufacture of leather in this Presidency is by no means so thriving as it might be, considering the great abundance of tanning materials at command. This is probably owing to the very low rank of the artisans, for the art of leather production is well understood and successfully practised by the European tanners at Pondicherry, Hoonsur, Guntur, Bangalore and Madras, the leather being scarcely inferior to that made in Europe. Goat skins, sheep skins, buffalo and bullock hides are much used and are generally procurable but are very badly dressed; currying the leather being the province of the shoemaker's wife, while manufacturing it for the market belongs to the husband. Inferiority of Indian leather may be ascribed to want of skill on the part of the currier and to the use of quicklime."

The following remarks of the Jury on Class 16 which included leather, saddlery, harness, skins for feathers and hair, are also of interest :—

"The tanned hides and skins exhibited are nearly all of excellent quality and will bear comparison satisfactorily with the same kinds of leather prepared in Europe. They have been thoroughly saturated with tanning materials, are free from animal odour, and their sections do not show the white line between the outer and inner surfaces, indicative, in bad leathers, of a hasty and imperfect inhibition of the tanned liquor. The collection comprises the tanned hides of bison, sambur, bullock, horse, cow, goat, kid, dog and iguana. The last is the only kind requiring any special mention here, as all the others are well-known articles of trade and commerce. The iguana skins which have been tanned and dyed black or left of their natural colour, are thin, even, soft, tough, elastic, granular or shagreen-like in external appearance From the absence of gloss the appearance of this leather is not much in its favour but it bids fair to be a durable article for light slippers and a good covering for the commoner kinds of instrument boxes such as are still done over with shagreen.

"*Tanned and coloured skins.*—Skins coloured and uncoloured for book-binding purposes and book linings are generally even, soft and pliant

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and very suitable for their intended uses. Some of these coloured leathers are very brilliant. Sheep and goat skins, tanned white, are exhibited here in much perfection. None of the specimens are fine enough for the better kinds of gloves but they are all as well suited as European skins of the kind for the purpose of the apothecary.

"*Wash leather.*—The skins prepared with oil in imitation of chamois or wash leather are all excellent specimens of the kind so far as thickness, softness, pliancy and colour are concerned. In all these respects they will bear comparison with the European article, but as every one of these leathers is tainted with the odour of the fish oil employed in their preparation they cannot be recommended for household purposes such as cleaning plate, though they will be found very suitable for cleaning brasses and harness."

A second Industrial Exhibition was held in Madras only two years later and the Jury on leather then reported as follows:—

"At a moment when the manufactures of this Presidency are in a transition state, passing from the old unaided manual labour system to all the great advantages conferred by the introduction of steam machinery it seems imperative that one of the most important should not be overlooked. The manufacture of leather in this Presidency, whether regarded with reference to the requirements of the public service or from a commercial point of view, is scarcely second to any other manufacture, either in extent or importance. But, before entering on the question of tanning, it may not be uninteresting or uninstructive to submit a brief sketch of the exports of hides and tanning substances, shipped at Madras for the last three years. Commencing with the years 1853–1854, the number of untanned hides exported chiefly to England, Holland and France, was 236,876 with a money value of Rs. 1,33,295; in the years 1854–1855 there were shipments of 2,195,165 hides with a value of Rs. 6,42,035; and in 1855–1856 the exports were 1,238,079 hides valued at Rs. 3,71,736; exhibiting a total number of hides, exported during the last 3½ years, of no fewer than 6,003 086, of the estimated value of Rs. 24.71,379. It has been before observed that the largest exports have been made to England, Holland and France, and to these may be added, Arabia, the Persian Gulf, the Indian French Ports, Sind; and, strange as it may appear, to Bengal for re-shipment to North America. Looking into these facts it is unquestionable that this Presidency possesses within itself the most ample means for meeting its requirements so far as the supply of raw hides is involved; and in concluding these remarks one very striking fact may be added, that the declared value of the hides exported from Madras during the month of February last (1857) reached the very large amount of Rs. 2,04,996."

From the same report we learn that the jury of 1857 did not take so favourable a view of the condition of the industry as was done at the previous exhibition, for they state that "of the tanned hides and skins exhibited, although several of the specimens are of a very satisfactory quality, it is unquestionable that the manufacture of leather in the Presidency is still capable of great improvement and development." At that date the leading tannery in the Presidency appears to have been maintained by the military authorities at Hoonsur, closely followed however by the Horse Artillery tannery at Bangalore and the Body Guard Pits in Madras. A list of the exhibitors who obtained awards at one or other of these two exhibitions, includes probably all the more important tanners in the Presidency and amongst them we find the names of Mr. Crowe of Madras, Narasingadu of Elloro, Kullappa of Bellary, Rungacharlu at Saidapet, Chingleput

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and Fallavaram, Veeraswamy Mudaliyar of Palghat, Meerapillai Labbai of Chingleput and Kasi Rao of Salem.

I have been unable to trace in detail the subsequent history of the leather trade in this Presidency. But from the information given in the statistical tables appended to this chapter it will be seen that the industry continued to steadily develope till nearly the middle of the seventies, when various causes operating at the same time led to a very rapid expansion. Up till that date the skins were consigned to dealers in England who disposed of them privately, but then, a change was made and public auctions were established. The conclusion of the Franco-Prussian War was followed by great activity on the part of Germany and about 1875 German tanners commenced buying East Indian skins in large quantities. Further in August of that year the export duty of 3 per cent. on skins was repealed; and, followed, as this was, almost immediately by the great famine of 1876–1877, which was attended with immense mortality among the livestock, an enormous expansion in the export trade in hides and skins took place and has ever since been maintained. Lastly, and perhaps of the greatest importance, was the completion of the main trunk lines of railways which enabled the Madras tanners to obtain supplies of raw materials from greatly extended areas.

From all the great sea-ports of India—Calcutta, Bombay, Madras, Karachee and Rangoon—there is a considerable export trade in hides and skins, but it is only from Madras and Bombay, and chiefly from the former, that these articles are sent out of the country in a partly manufactured state. As regards Madras, the exports of raw hides have always been very small and previous to the year 1899 there were no exports of raw skins but in the latter part of that year the export of raw skins commenced on a very large scale and still continues, although there has been a considerable falling off from the enormous exports of 1901. The demand for raw skins comes mainly from America where they are converted into leather by the chrome process. The greater proportion of the skins are dry salted but some are unhaired and pickled before they leave Madras. At the present time tanned hides are exported in a half manufactured state to be retanned and curried by the leather manufacturers of England. The direct exports to America and the Continent are comparatively small. Although so far there has been no material change in the condition of this trade, it is not improbable that the causes which have led to the export of raw skins in such enormous quantities during the last 4 years may also, at some later date, affect the business now carried on in Madras in tanned hides. It must be remembered that, large as the Madras business is in hides and skins, that of Calcutta is much larger and nearly the whole of the Bengal trade has always been in raw hides and skins.

The export trade from Madras in both hides and skins has never been entirely dependent upon local supplies as large numbers are brought down to Madras to be tanned, from the Punjab, the United Provinces, Central India and parts of the Bombay Presidency. It is therefore not unlikely that if the demand from Europe and America for raw materials continues to increase the total volume of exports

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from Madras will decrease owing to the shipment of raw hides and skins from other and more favourably situated ports; those of the Punjab being sent to Karachee, those of the United Provinces to Calcutta, and the exports of Central India and the Bombay Presidency to Bombay. So far, there are no indications of a shrinkage in the total amount of business done through Madras and the change effected seems to be simply that skins are exported in a raw instead of a tanned condition. From the trade returns of 1902–1903 it appears that the average value of a raw hide is Rs. 3–7–8 and of a tanned hide, Rs. 3–8–0, whilst the average value of raw skins exported is Rs. 1–7–8, that of tanned skins Rs. 1–4–3.

It is obvious from these figures that the best of the raw materials are exported from the country in a raw condition and that all the rejections from the purchases of raw hides and skins are tanned before they are exported. This tendency to export all the better class hides and skins in a raw state is to be regretted as it naturally follows that the proportion of inferior tanned goods will correspondingly increase, with the result that the reputation of Madras tannages will decline. On the other hand, it must be remembered that the competition for raw materials has greatly increased and much higher prices are now obtained by the owners of cattle for hides and skins than was formerly the case, so that on the whole though the reputation of the Madras tanned goods may decline in western markets yet, the country, as a whole, probably benefits from the increased value obtained from what was formerly practically a waste product.

So far we have dealt with the export trade and a few words will suffice for the import.

Table V is extracted from the Custom House returns of the last three years, and shows that there is a small trade, chiefly with Ceylon and the Straits in raw skins and hides, which are sent here to be tanned and re-exported. The imports of dressed skins are mainly morocco and roans for book binding and upholstery work. The tanned hides and leather are largely used for the manufacture of harness and country-made boots and shoes. It will be seen that the total value of the imports of manufactured leather in all forms does not exceed three lakhs of rupees per annum and though it is probable that Madras receives some of its imports through Bombay, yet it is evident that the whole trade is a comparatively small one and does not offer sufficient scope for private enterprise out here. Quite lately, however, several laudable attempts have been made to dress leather in Madras of sufficiently good quality to meet the local demands and to some extent these efforts have succeeded, but so far they must be regarded as preliminary experiments which may or may not be followed by more energetic efforts.

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TABLE I.—*Exports by Sea from Fort St. George during* 1846-47

—	Foreign Ports.							
	United Kingdom.		America.		Other Foreign Ports.		Total.	
	1		2		3		4	
	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.
Raw hides ...	48,212	22,483	...	...	386	425	48,598	22,908
Raw skins ...	67,845	8,545	157,500	31,500	2,490	265	227,835	40,310
Hides and leather	9,358	4,797	...	...	4,807	1,110	14,165	5,907
Skins, tanned ...	...	...	...	...	13,838	1,459	13,838	1,459

—	Home Ports.							
	Bengal.		Other Home Ports.		Total.		Grand Total.	
	5		6		7		8	
	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.
Raw hides ...	1,860	1,326	1,454	600	3,314	1,926	51,91[illegible]	24,834
Raw skins ...	916,946	1,84,382	6,500	700	923,446	1,85,082	1,151,281	2,25,392
Hides and leather	1,08[illegible]	218	553	235	1,641	453	15,806	6,360
Skins, tanned ...	87,441	9,808	71,310	7,308	158,751	17,116	172,59[illegible]	18,575

TABLE II.—*Exports by Sea to Foreign Ports from the Madras Presidency during* 1902–1903.

	United Kingdom.		United States.		France.		Ceylon.		Belgium.		Holland.		Italy.		Natal.		Canada.	
	1		2		3		4		5		6		7		8		9	
	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.
Raw hides	13,802	46,002	240	2,178	660	2,970	3	16	...	...	...	...	...	...	...	...	...	...
Do. skins	350,285	5,03,516	2,272,650	33,85,587	35,264	47,048	...	...	3,300	4,690	1,500	1,466	608	608	216	2,255	1,800	2,700
Tanned hides	1,514,852	52,96,154	41,693	1,43,583	...	...	728	5,237	...	...	...	...	...	...	...	...	...	...
Do. skins	10,509,339	1,41,95,053	2,066,350	26,29,136	52,437	78,808	67,383	48,792	...	...	...	...	...	...	...	...	...	...
Horns...	Cwt. 2,962	1,27,955	...	...	Cwt. 123	3,058	Cwt. 7	336	Cwt. 23	650	...	...	...	...	...	...	...	..

	Germany.		British East Africa.		Egypt.		Japan.		Straits Settlements.		Turkey in Asia.		Victoria.		Grand Total.	
	10		11		12		13		14		15		16		17	
	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.
Raw hides	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14,705	51,166
Do. skins	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2,665,623	39,47,870
Tanned hides	1,000	3,500	50	250	125	1,250	210	611	...	..	480	4,077	...	...	1,559,148	54,54,662
Do. skins	...	...	750	502	...	...	315,386	2,32,263	867,291	4,65,196	...	...	4,664	4,434	13,883,600	1,76,49,183
Horns...	Cwt. 168	5,528	...	...	...	...	...	...	...	...	...	...	...	...	3,283	1,37,527

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TABLE III.—*Statement showing the quantity and value of Hides and Skins exported to Foreign ports from the Madras Presidency.*

Years.	No.	Value.
		Rs.
1862-63	2,809,532	12,10,013
1863-64	3,379,837	14,78,337
1864-65	3,527,491	15,69,543
1865-66	3,470,144	15,12,484
1866-67	4,052,193	19,20,186
1867-68	4,536,672	25,57,389
1868-69	4,846,920	25,80,719
1869-70	5,619,924	30,81,953
1870-71	5,658,032	31,44,802
1871-72	7,063,495	39,99,564
1872-73	8,390,287	52,39,353
1873-74	8,265,264	52,77,500
1874-75	6,615,851	44,45,836
* 1875-76	8,987,874	1,00,84,153
1876-77	9,827,325	1,18,98,442
1877-78	10,836,074	1,46,59,521
1878-79	8,789,739	99,71,364
1879-80	9,798,727	1,06,86,846
1880-81	10,815,127	1,28,77,882
1881-82	12,562,219	1,51,31,714
1882-83	14,039,132	1,84,89,229
1883-84	13,843,419	1,74,73,379
1884-85	12,763,214	1,59,43,398
1885-86	15,090,944	1,84,02,184
1886-87	15,415,837	1,83,66,822
1887-88	17,106,984	2,07,26,638
1888-89	17,940,729	2,10,96,275
1889-90	17,196,861	2,02,33,163
1890-91	16,802,164	2,00,65,844
1891-92	18,311,652	2,24,10,229
1892-93	18,217,383	2,41,63,892
1893-94	18,343,907	2,62,24,090
1894-95	20,828,585	3,06,44,717
1895-96	21,706,892	3,32,16,926
1896-97	19,679,949	3,06,22,445
1897-98	19,111,898	3,10,61,023
1898-99	17,460,435	2,63,96,637
1899-00	19,060,768	2,89,66,104
1900-01	22,946,170	3,68,61,023
1901-02	17,933,636	2,67,68,035
1902-03	18,123,076	2,71,02,881

* NOTE.—I have been unable to find any satisfactory explanation for the enormous increase in the value of hides and skins which took place in 1875-76. The increase is almost 100 per cent., and, though the reasons stated on page 6 powerfully operated to raise prices, I am inclined to think that the sudden change is due in part to a different method of estimating values having been adopted when the export duty was abolished.

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Table IV.

Exported to	Export.	From all India.		From Madras.	
		Value.	Total value.	Value.	Total value.
1899-1900.		Rs.	Rs.	Rs.	Rs.
United Kingdom...	Raw Skins.	12,41,213		2,22,514	
Rest of Europe ...		5,25,395		18,170	
America ...		1,78,57,459		13,76,334	
			1,96,24,070		16,17,018
United Kingdom...	Dressed Skins.	2,04,60,621		1,40,21,307	
Rest of Europe ...		6,08,674		5,07,138	
America ...		55,31,742		55,26,753	
			2,66,01,037		2,00,55,198
United Kingdom...	Raw Hides.	68,63,920		.....	
Rest of Europe ...		3,01,85,408		419	
America ...		1,14,15,602		.....	
			4,84,64,930		419
United Kingdom...	Dressed Hides.	83,47,032		66,03,232	
Restof Europe ...		15,725		14,125	
Ame rica ...		1,26,235		1,26,235	
			84,88,992		67,43,592
	Total ...		10,31,79,029		2,84,16,227
1900-1901.					
United Kingdom...	Raw Skins.	19,88,467		3,26,259	
Rest of Europe ...		6,85,199		11,163	
America ...		1,45,37,044		16,62,701	
			1,72,10,710		20,00,123
United Kingdom...	Dressed Skins.	2,39,10,070		1,64,33,651	
Rest of Europe ...		1,86,682		1,42,078	
America ...		49,98,306		48,78,107	
			2,90,95,058		2,14,53,836
United Kingdom...	Raw Hides.	84,02,564		2,570	
Rest of Europe ...		3,38,82,357		.....	
America ...		96,36,123		123	
			5,19,21,044		2,693
United Kingdom...	Dressed Hides.	1,41,15,454		1,20,36,404	
Rest of Europe ...		1,14,921		74,066	
America ...		2,75,262		2,74,846	
			1,45,05,637		1,23,85,316
	Total ...		11,27,32,449		3,58,41,968
1901-1902.					
United Kingdom...	Raw Skins.	36,58,220		7,61,318	
Rest of Europe ...		9,96,569		63,095	
America ...		2,23,11,148		51,44,230	
			2,69,65,937		59,68,643
United Kingdom...	Dressed Skins.	1,59,17,406		1,11,32,233	
Rest of Europe ...		48,716		37,897	
America ...		25,05,237		24,60,968	
			1,84,71,359		1,36,31,098
United Kingdom...	Raw Hides.	11,52,033		78,760	
Rest of Europe ...		2,10,50,006		.....	
America ...		56,02,679		14,285	
			2,78,04,718		93,045
United Kingdom...	Dressed Hides.	74,97,133		65,93,019	
Rest of Europe ...		17,136		459	
America ...		91,600		91,600	
			76,05,869		66,85,078
	Total ...		8,08,47,883		2,63,77,864

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TABLE IV—*cont.*

Exported to	Export.	From all India.		From Madras.	
		Value.	Total value.	Value.	Total value.
1902–1903.		RS.	RS.	RS.	RS.
United Kingdom...	Raw Skins.	32,68,541		5,03,516	
Rest of Europe ...		12,26,591		53,813	
America ...		2,06,82,060		33,88,287	
			2,51,77,192		39,45,615
United Kingdom ..	Dressed Skins.	1,92,29,718		1,41,95,053	
Rest of Europe ...		81,440		73,808	
America ...		26,29,136		26,29,136	
			2,19,40,294		1,68,97,997
United Kingdom...	Raw Hides.	12,86,007		46,002	
Rest of Europe ...		2,37,09,315		2,970	
America ...		37,79,602		2,178	
			2,87,74,924		51,150
United Kingdom...	Dressed Hides.	60,27,413		52,96,154	
Rest of Europe ...		3,500		3,500	
America ...		1,43,583		1,43,583	
			61,74,496		54,43,237
	Total ...		8,20,66,906		2,63,87,999

TABLE V.—*Imports.*

——	1900–1901.		1901–1902.		1902–1903.	
	NO.	RS.	NO.	RS.	NO.	RS.
Raw Hides	5,855	11,261	13,516	28,644	10,758	22,100
Raw Skins	175,547	2,25,967	213,948	2,79,354	222,786	3,11,184
Boots and Shoes ...	28,425	86,672	20,652	68,878	25,040	68,802
Skins (dressed or tanned.)	12,712	34,728	9,983	45,624	11,468	31,766
Hides (dressed or tanned).	10,659	44,598	9,032	29,951	13,056	57,516
Leather (unwrought)...	...	...	24	6,535	184	34,291
Saddlery and Harness .	...	9,632	...	19,501	...	33,497
Other sorts	...	899	...	65,196	...	63,951

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CHAPTER II.

TANNERS AND LEATHER-WORKERS.

From the Census returns of 1901 it appears that the total number of people in the Madras Presidency who are partially or entirely dependent upon one or other branch of the tanning and leather working trades is 190,011. Of this number, 9,294 are engaged in the manufacture of leather from hides and skins; 111,865 are returned as boot, shoe and sandal makers, and 50,796 as water-bag, well-bag, bucket and ghee-pot makers; whilst of leather dyers there are apparently only 77.

The export trade and the financing of the industry is mainly in the hands of the large mercantile houses in Black Town and, at one time or other, almost all the large firms in Madras have traded in skins; of late years, however, owing to the keenness of the competition and the violent fluctuations in the prices obtained at the London auction sales, the trade has become a very speculative one and a good many European firms have dropped it. The collection of hides and skins, and the work in the tanneries is entirely in the hands of poor Muhammadans, and the old native leather workers of the country, whose social position is so extremely low that there is much dispute between them and the pariahs as to which occupies the more honored position. In the Telugu districts they are known as the Madigas, whilst in the Tamil districts they are called Chakkiliyans. The former are mainly found in the Ceded districts and the Coast districts from Nellore to Vizagapatam. They number over three-quarters of a million but many of them no longer pursue their hereditary calling. The Revd. H. Huizinga of the American Baptist Mission at Ongole has kindly furnished me with the following note:—

"The Madigas or Matangas, sons or descendants of King Matanga, are an ancient tribe, probably of Dravidian origin, inhabiting the districts of the Madras Presidency north of Madras. They are most numerous in the Nellore and Kistna districts. Traditions and certain customs indicate that at one time they occupied an independent and exalted position but for centuries they have been considered to be the veriest slaves of the Sudras and the higher castes. They are very poor, their clothing is scanty, their food is coarse and insufficient, their homes are but hovels, built in circular form of mud, with thatched roofs but without windows or frames. They live in small hamlets at a respectable distance from the villages of the caste people by whom they are greatly despised. Their habits are squalid in the extreme, and the odour of a Madiga hamlet is revolting. They perform all the lowest kinds of services for the caste people, especially bearing burdens and working in leather. They take charge of the ox or buffalo as soon as it dies. They remove the skin and tan it, and eat the loathsome carcass which makes them specially despised and renders their touch so polluting. Some of the skins are used for covering the rude drums that are so largely used in Hindu festivals and beaten in honour of the village deities. The caste men impress the Madigas into their service, not only to make the drums but also to beat them at their feasts. It may be mentioned that nearly ten per cent. of the Madigas are nominal Christians and in some parts of the Nellore district the Christians form over one half of the Madiga population. This changes their habits of life and also their social position. Eating of carrion is now forbidden as well as beating of drums at Hindu festivals and their refusal

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in this particular often leads to bitter persecution at the hands of the caste people. The main duty of the Madigas is the curing and tanning of hides and the manufacturing of rude leather articles, especially sandals, trappings for bullocks and large well buckets used for irrigation. The process of tanning with lime and *tangadu* bark is rough and simple. As did their forefathers, so do they even to this day. The quality of the skins they turn out is fair and the state of the development of the native leather trade compares very favourably with that of other trades such as blacksmithy and carpentry. I think it speaks well for the intelligence and industry of the despised Madiga that he has made so much of his small opportunities. In the manufacture of leather goods the Madiga has shown not less ability. The needs of his customers have hitherto been very small but what he makes is perfectly adapted to its uses. His sandals are strong, comfortable and sometimes highly ornamental. His manner of working and his tools are as simple as his life. He often gets his pay in kind, a little fodder for his buffalo, so many measures of some cheap grain, less, if the crop should be poor, perhaps a few green vegetables, etc. It is very difficult to estimate how much the village cobbler does earn ; but if he is a good workman it is at least a fair average cooly wage and possibly a little more."

In the Northern districts the Madigas are attached to one or more families of ryots and they are entitled to the dead animals of their houses. Like the Vettiyan in the south the Madiga is paid in kind and he has to supply sandals for the ryots, belts for the bulls and all the necessaries of agriculture and for these he has to find the requisite leather himself; but for larger articles such as water-buckets the master must find the leather. Of late years there is a tendency observable among Madigas to poach on each other's monopoly of certain houses and among the ryots themselves to dispense with the services of family Madigas and to resort to the open market for their necessaries. In such cases the ryots demand payment from the Madigas for the skins of their dead animals. The skins and hides that remain after local demands have been satisfied are sold to merchants from the Tamil districts and there is generally a central agent to whom the various sub-agents send their collections and by him they are dried and salted and sent to Madras for tanning.

As mentioned by Mr. Huizinga, the Madiga enjoys certain social privileges which will accord with his otherwise humble position. At every festival of the village Goddess he is entitled to blow the horn ; he enjoys the privilege of canvassing the opinion of by-standers before a victim is sacrificed at the altar, he gives the word to slay it, and with his own hand cuts the victim when it is a he-buffalo He is the repository of the traditional liplore and to him is entrusted the singing of ballads at and after the religious sacrifices. An unmarried woman of Madiga class is chosen as the Matangi and is looked upon as the representative of the goddess of that name. Her sanctifying touch and spittle are indispensable at the feast of the village goddess and are eagerly sought for by all classes other than Brahmans before a marriage or similar rejoicing is celebrated. The Madiga calls himself the child of Matangi, who was Siva's wife, and a woman of this class is, in the opinion of Sakti worshippers, a favourite abode of their goddess. In the Kistna district children have little leather strings hanging from their left shoulders like the sacred cord of the Brahmin, from which is suspended a bag containing something put in it by a Madiga to charm away all forms of disease from the infant wearer.

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From the North Arcot District Manual, the following extract is taken:—

"Madigas are workers in leather, an occupation of which they had the monopoly until the Muhammadans and Labbais appeared upon the scene. Whether they or the Malas are the lowest is a subject of dispute between the two classes, but by others they are considered as about equally low, and not caste people at all, and are not therefore allowed to ascend the Tirupati hill, enter the portico of a pagoda, or walk in the streets of a Brahmin village. The Madigas will not take food or water from Pariahs, nor the latter from the former, a prejudice which is taken advantage of in the Kalahasti Raja's stables to prevent theft of gram by the Pariah horsekeepers, the raw gram being sprinkled with water by Madigas in the sight of the Pariahs. The name Madiga is said to be a corrupt form of Matanga, a descendant of the sage Matanga Muni, and according to a tradition current in the caste, the Madigas or Matangas have fallen to their present abject position owing to the curses of their ancestor Matanga Muni. There was a Matanga dynasty in the Canarese country, and the Madigas are by some believed to be the descendants of people who were once a ruling caste. Their only tradition refers to one Arundhati, a Madiga maiden, whom, they say, the rishi Agastya considered fit to be his wife. Proud of this distinction the cobblers often call themselves Arundhati's caste. They are very filthy in their habits, eat almost anything, and drink to excess. The Madigas affect to worship the Hindu gods but their favourite deity is Matangi. A widow may not remarry, but can live in concubinage without any disgrace.

"At marriages the bridegroom has to provide thirty-five new pots and a sum of Rs. 5, which is spent in drink consumed by the guests. The ceremony is performed by their own priests, for no Brahmin will approach their haunts. They are the drummers and horn-blowers of their village, their horn being called 'bankha' and their drum 'tappati,' but their main occupation is tanning and leather-working, and they usually claim the privilege of taking free of payment the hides of all animals dying in the village, and are not always above increasing the death-rate by means of poison."

In the Tamil country the place of the Madiga is taken by the Chakkiliyans of whom there are nearly half a million, resident chiefly in the districts of Salem, Coimbatore and Madura. They are apparently emigrants from the Telugu and Canarese districts as a large proportion of them speak Telugu or Canarese though living in a Tamil country; and there is not much doubt that their social position is even lower than that of the Pariahs. Nominally they are Saivites, but in reality devil worshippers. The *Avaram* plant is held in much veneration by them and the *tali* is tied to a branch of it as a preliminary to marriage. Their women are considered to be very beautiful and their widows may remarry. They indulge very freely in intoxicating liquors and will eat any flesh, including beef and pork. The position of the Chakkiliyan in the south differs greatly from that of the Madiga in the North and many of his privileges are enjoyed by a sub-sect of the pariahs called Vettiyans. These people possess the right of removing dead cattle from villages and in return have to supply leather for agricultural purposes. The majority of Chakkiliyans are not tanners but leather workers, and instead of getting the hides or skins direct from the Vettiyan they prefer to purchase them ready-tanned from traders who bring them from the large tanning centres. The village chuckler earns about 3 or 4 annas a day. In towns he either

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works for himself or is engaged by dealers in sandals and shoes and gets from 4 to 6 annas a day as wages. The cleverer among them are employed as maistries and earn from 8 to 10 annas a day.

Persons other than chucklers engaged in leather-work.—In nearly every district of the Presidency are to be found representatives of a Mahratta caste of painters and leather-workers who are very numerous in the Bombay Presidency. These are the muchis who at the last census numbered 5,804. They claim to be Kshatriyas, wear threads and have Brahmin priests. These pretensions are not admitted on the Bombay side where the Muchis occupy a very low position in the social scale although they are considered superior to outcastes. The muchi is not a tanner and as a leather-worker only engages in the higher branches of the trade. Some of them make shoes but draw the line at sandals; others are harness makers and are called Jinigarus; whilst a considerable number are engaged as menial servants in Government offices. Throughout the country nearly every office has its own Muchi whose principal duty is to keep in order the supplies of stationery and from raw materials manufacture ink, envelopes and covers and generally make themselves useful. A good many of the so-called muchis, however, do not belong to the caste as very few have wandered south of Madras and they are mostly to be found in Ganjám and the Ceded Districts.

In the Malabar district the trade in raw hides and skins is chiefly in the hands of Mappillas. They are not tanned in the district but are exported largely to Ambur and Vellore. Weekly fairs are held at several places in the district and all the available hides and skins are put up for sale and are purchased by Muhammadans. In this district besides chucklers there are three other castes, also engaged in leather work:

(1) *Thole-Perunkollans* (*literally, leathersmiths*).—These are blacksmiths by caste who abandoned their hereditary trade for leather work and they are chiefly employed by Mappillas. One peculiar custom in this caste is that two or more brothers may have one wife in common. Only those in good circumstances indulge in the luxury of a private wife.

(2) *Mappillas.*—These are Malayalam-speaking Mussulmans, either of mixed descent or converts to Islam. Some of them have taken to leather working and they are considered to be specialists in the making of ceruppus or leather shoes.

(3) *Panans,* who are supposed to be the descendants of a hill tribe who had settled in the plains. They are exorcists and devil dancers and their chief occupation as leather-workers is in the manufacture of drum-heads.

From the foregoing accounts of the various classes engaged in the leather trade it will be seen that they are entirely confined to the lowest classes of the community; and before any material improvements can be introduced into the processes by which leather is now manufactured, it will be necessary either to educate these degraded classes or induce more intelligent workmen to enter tanneries. The number of people engaged in actual tanning is comparatively small and in good seasons there is often great difficulty in obtaining a sufficient number

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of men to carry on operations. Most of the actual workmen in tanneries are also agriculturalists or do cooly work for the ryots; and in good seasons when work is plentiful and food cheap, they can only be induced to work in tanneries by the offer of comparatively high wages. The opinion is generally held among the merchants of Madras engaged in the export trade that no improvements can be effected in the tanning processes now in use because of the difficulty of getting workmen sufficiently skilled and intelligent to carry them out. But this is scarcely borne out by the history of the trade as during the last three-quarters of a century great improvements have been effected in the methods of tanning and the quality of the outturn. Although the tanners and the leather-workers are the lowest of the low, yet they are not deficient in intelligence and there is but little doubt that if the enterprise were forthcoming, which is necessary, to start modern methods of tanning there would be little difficulty in obtaining, after a short time a sufficient amount of labour skilled enough for the work.

CHAPTER III.

HIDES AND SKINS.

The tanning trade in the Madras Presidency is by no means solely dependent upon local supplies of either hides or skins. Large quantities of hides are sent down from Calcutta and fairly large supplies are received from the Nizam's Dominions and parts of the Bombay Presidency. The area from which skins are drawn is even larger, and extends as far north as Amritsar in the Punjab, whilst supplies are received by sea from Ceylon and the Straits Settlements. Indian hides are, as a rule, of inferior quality and the bulk of them are small. The number exported from India either in a tanned or raw condition, is large enough to form an important branch of the leather trade in Europe and America, where they are known as East India kips and are largely used for upper leathers Large hides are usually retained in the country for local consumption as, if they are in good condition better prices can be obtained for them than on a market where unusual sizes are not looked for. In the trade, hides are classified under the terms 'cow' and 'buffalo', whilst those below a certain weight are termed 'calf'. The inferiority of Indian hides is in part due to the poorness of the cattle and in part due to the fact that they are heavily branded and as many of them are used for draft work their hides show signs of wear and tear. Except in large towns and more especially in cantonments, cattle are never killed for food and the only hides available are those taken off animals which have died from disease, old age or injury. The slaughter-house hides are those obtained from cattle which have been fattened up for killing, are usually of good quality and, in the case of cow hides, might well be used for making sole-leather but their number is so small that the whole Presidency could hardly supply enough to keep one tannery going. Hindus are very averse to killing animals and they allow their cattle to linger on in sickness and old age when it would be kindness to the poor beasts to

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put an end to them. The animals suffer and naturally their skin deteriorates. But the most fruitful source of injury is the merciless way in which cattle are branded. The branding process is carried to such an extreme that many thousands of hides are absolutely ruined and a very large number are depreciated 50 per cent. in value through branding which is either done to satisfy the owner's aesthetic eye or calm his troubled mind. Branding is supposed to be efficacious in keeping away evil spirits and preventing disease. It is also largely resorted to as a remedy for many diseases especially anything in the nature of staggers or fits. Now that hides have a very distinct market value and are easily disposed of, a man's cattle are always liable to be killed simply for the sake of the hides and there is no doubt that branding cattle and thereby rendering their hides of little value is an efficacious way of insuring them against the poison of the sneaking Vettiyan.

An examination of the tables appended to Chapter I shows that, whilst, from other parts of India, nearly all the hides are exported in a raw condition, in the Madras Presidency the reverse is the case and here the exports of raw hides are of little practical importance. Small hide tanneries are to be found in nearly every district of the Presidency but the great bulk of the trade is concentrated round Madras, at Bangalore, Vellore, Dindigul, Coimbatore and Trichinopoly. Fresh hides from the slaughter-houses are of importance only in Bangalore and Madras and the numbers available for the last five years will be found in Table I appended to this Chapter. The majority of hides obtained in this Presidency are received by the tanners in a wet salted condition, whilst those which come from more distant places are mainly flint-dried. The bulk of the latter are what are known in the trade as 'Calcutta rejections' and are invariably more or less damaged.

The local demand for leather, although small compared with the population, is, in the aggregate, of very large amount. As regards the export trade, elaborate statistics are available, but nothing is accurately known regarding the internal trade and it is only possible to estimate it roughly by very indirect methods. The Census Returns show that there are more than 150,000 people engaged in the manufacture of leather goods; and if we assume that on an average they earn about 3 annas a day their total annual income will exceed one crore of rupees. How much leather they actually use can only be guessed at, but if we assume that its value is not more than double that of their wages, we shall certainly not overestimate it, and on this assumption we arrive at the result that at least two crores of rupees worth of leather is used in this Presidency. Buffalo hides are mainly used for sandals, soles of shoes, harness and probably ropes, whilst the main demand for cow hides is to supply the ryots with the water bags or mhotes with which they lift water from wells for the irrigation of their fields. From the information which is available regarding the number of wells used for irrigation, it is almost certain that over a million hides per annum are consumed in this one branch of the industry.

Although the export of tanned hides from Madras is very large, yet, if we exclude those which come to the Madras tanneries from other Presidencies, it will be evident that only a comparatively small

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proportion of the local supply of hides is available for export and that by far the greater number are required for local use. Hides for export are classified as 2nds, 3rds, 4ths, and 5ths or rejections. There are no 1sts as it is seldom that hides of sufficiently good quality can be obtained. In making up a parcel of 100 hides the trade requires that there should be about 30 2nds, 40 3rds, 25 4ths and 5 5ths. The 2nds are practically sound hides; the 3rds are slightly defective and have usually small brands of holes on one side only; in the 4ths defects are numerous and they are generally branded on both sides; whilst the 5ths may possess all kinds of defects and are always very badly branded. Hides, in the trade, are known by the name of the place at which they are tanned, and the best hides exported from Madras come from Secunderabad, Bangalore and Ranipet. Hides naturally vary in weight very considerably, but the bulk of those exported are only from 6½ to 9 lbs. in weight and their value from As. 10–6 to As. 11–6 per lb. Buffalo hides are usually much heavier than cow hides, but the leather is of inferior quality, being loose and spongy, and it fetches a much lower price, the average rate being about As. 8 a lb. Hides vary very much in quality depending upon the nature of the season, and in famine years when the number thrown on the market is abnormally large they are always of inferior quality. Hides are generally in the best condition when there is plenty of grass available and, as a general rule, the best hides reach Madras for export in December and January. After the rains the yield of leather from hides decreases by from ½ to 1 lb. and the tanners attribute this to some change in the quality of the water; but as it is to this cause that nearly everything is attributed which is inexplicable to them, it is probably not correct, and it is far more likely to be due to changes in the physiological condition of the hide, consequent upon the better feeding which the animals get when there is plenty of grass.

Skins.—The skin trade in the Madras Presidency is a very important one and, as the local consumption of tanned skins is much less than that of tanned hides, a much larger proportion of the total yield of skins in the Presidency is available for export.

The term 'skins' is technically only applied to pelts of sheep and goats. Goat skins are larger, heavier and of much better texture than sheep skins. Unlike hides the majority of skins are derived from animals which have been slaughtered for food and the pelts are therefore in much better condition and will compare favourably with similar classes of skins from other parts of the world. The tanning of skins is confined to Bombay and Madras and the bulk of the business is done in the latter Presidency. East India skins are in very large demand in Europe and America and for many years past, with temporary fluctuations, there has been a steady rise in their value. Besides local supplies, the Madras tanners receive large numbers from other parts of India; and from such centres as Cawnpore, Agra, Delhi, Amritsar, Sholapur, Amraoti, Hyderabad and Poona, many thousands of skins are sent down by rail every year. The quality of skins varies very much with the season of the year but unlike hides, they are generally at their worst during the rainy weather. Goat skins are usually in good condition from February to the middle of September and sheep skins from March to about the same date. During the rainy season

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the animals become feverish through exposure and the effect shows in the pelts. The hair grows long on account of the cold and this leads to loss of tissue, with the result that the pelt is thin and papery. During cold weather *puripuri* is very common among the flocks and this, when serious, greatly diminishes the value of the skins and renders them unfit, after tanning, for anything in the nature of first-class work. Buyers of raw skins for export generally cease operations during the cold weather.

The majority of the dried skins, which during the last few years have been exported from Madras, are for chrome tanners in America. Skins tanned by the chrome process do not gain substance in the same way as in vegetable tanning, and plump well-nurtured skins are therefore in great demand by chrome tanners. The bulk of the Madras skins exported to America are converted into glacé kid and the demand is for large skins. Anything less than a spread of 75 square feet per dozen skins is regarded as unsatisfactory. Moreover, every skin should be at least 21 inches wide so that when converted into glacé kid it may be possible to cut two sets of "upper sides" from each skin.

The export merchants are mostly men who formerly, or even now, continue to run tanneries and they have set up curing yards outside their tanneries. A large open piece of land is all that is required and the surface is just dressed over with mud. The skins on arrival are carefully sorted—those damaged or too small are rejected; those considered good enough for export are stretched out on the ground and pegged down with iron nails, flesh side uppermost. The skin is then rubbed with a saturated solution of sulphate of soda and allowed to dry. The process may be repeated a second time, after which the skins are packed in bales and sent to the godowns of the shipping merchants. The sulphate of soda is obtained from the United Provinces where it occurs in local deposits. The rejected skins are tanned and exported, many of them going to Singapore.

A skin expert in Madras who buys largely for export, classifies goat skins according to the districts from which they come as follows:—

(1) Madras town, with its local supply of slaughter-house skins from neighbouring districts.

(2) Northern Circars; from Nellore, Nandyal, Bezwada, Cocanada, Vizianagaram and Berhampore.

(3) Ceded districts, along the Madras Railway from Adóni to Raichur.

(4) Hyderabad, with Secunderabad as the centre.

(5) Bangalore, from Jalarpet to Mysore.

(6) Coimbatore, from Salem to Calicut.

(7) Trichinopoly, from Tanjore southwards, including the whole country served by the South Indian Railway.

(8) The Deccan, extending from Sholapur to Bombay and from Manmad in the north to Darwar in the south.

(9) Central Provinces.

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Each of these districts produces a different kind of skin and with features so strongly marked that they easily enable an expert to distinguish the skins of one district from another. As regards quality those from Coimbatore and Trichinopoly are far the best. Next to them come the skins from Bangalore, Hyderabad and the Deccan, whilst inferior to them are the skins from Madras, the Ceded districts and the Northern Circars. Lastly come the skins from the Central Provinces which are inferior to all the others. This classification, it must be remembered, is from the point of view of an exporter of dried skins and he naturally regards them entirely from the chrome tanner's point of view, which probably differs slightly from that of the vegetable tanner. Both require skins with a good grain but plumpness and a firm texture are of greater importance to the chrome tanner. On the London market Madras slaughter-house skins take the first place, although in this classification they are placed very low down, the reason being that although the skins are of no great value for chrome tanning, yet, owing to the care with which they are tanned and the excellence of the grain, they are well suited for conversion into highly finished book-binding leathers.

Sheep skins.—There are three kinds of sheep available in the country; (1) wool sheep, (2) hair sheep, (3) short-hair sheep. The wool sheep form the majority. Their skins are spongy and loose and are of no great value. Out of the 9 districts already mentioned, hair sheep are only found in five—Madras, the Northern Circars, the Ceded districts, Coimbatore and Trichinopoly; and even in these districts there are a considerable number of wool sheep. The short hair sheep are only found in the Trichinopoly district and they yield a very plump leather which in its finished state is comparable with that of tanned goat skins.

The majority of skins are received in the tanneries in a wet salted condition but in large towns like Madras, Trichinopoly and Bangalore, a large number of slaughter-house skins are always available. The price of skins varies according to their size and condition. Goat skins are worth from Rs. 120 to Rs. 200 per 100 and average probably not less than Rs. 150. Sheep skins are much smaller, weigh less, and fetch a smaller price per lb. One hundred goat skins will weigh about 80 lbs. and 100 sheep skins about 55 lbs. The average value of 100 sheep skins is about Rs. 70.

Besides the hides and skins of what we may term 'domestic animals,' the Presidency yields a considerable number of skins of wild animals, the majority of which are exported. Deer skins are by far the most numerous but there are occasionally consignments of the skins of almost all the wild animals found in the Presidency. Amongst them may be mentioned elephants, tigers and leopards; but in the aggregate they are of no commercial importance. Deer skin is considered by Hindus an emblem of purity and it is on that account specially valued by Brahmins. The orthodox Brahmin uses the deer skin for his seat when he offers prayers to God. Such skins are never unhaired and are preserved from decay by being dressed on the flesh side with a mixture of alum and salt. Such skins are also used for making bags and small cases in which Hindus keep the white, yellow and red paints they use for making their caste marks. Tiger skins

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are regarded with some sanctity and are chiefly used by the yogis and ascetics.

The following table shows the number of sheep, cattle and pigs slaughtered during the last five years within the Municipalities of Madras and Bangalore. The information is interesting as showing that a comparatively small number of animals are used for food in India :—

Year.		Number of sheep and goats slaughtered.	Number of cattle slaughtered (cows, buffaloes, oxen, &c.)	Number of pigs slaughtered.
1898–1899	Madras	343,220	8,518	619
	Bangalore	113,967	18,402	725
1899–1900	Madras	342,856	10,412	977
	Bangalore	131,406	21,012	756
1900–1901	Madras	349,058	11,475	1,135
	Bangalore	129,369	19,963	701
1901–1902	Madras	343,270	13,474	1,023
	Bangalore	118,515	18,609	714
1902–1903	Madras	342,222	16,212	1,833
	Bangalore	138,760	19,389	604

CHAPTER IV.

TANNING MATERIALS.

We have already seen that the tanning industry in this Presidency owes its extensive development to the cheapness and the excellent quality of the raw materials used in the tanning pits. Avaram bark (*Cassia auriculata*) and myrabolams (*Terminalia chebula*) are almost exclusively employed in the tanneries whose products are chiefly for export; but the local tanners often get their supplies from other sources and the investigations of the Forest Department show that there are in the forests and on the waste lands a very large number of trees and shrubs which are capable of yielding tannin in sufficient quantities to be of practical importance. The Conservator of Forests in the Northern Circle has furnished me with a list of no less than 70 tannin-yielding shrubs and trees and such information as is available regarding the majority of these is to be found in the Agricultural Ledger No. I of 1902, by Mr. D. Hooper which contains a useful summary of the information regarding the raw

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stuffs of India, which contain tannin. The Madras Forest Department derive a revenue of considerably over a lakh of rupees from the sale of the right of collecting tannin-yielding materials. The supply is apparently enormously greater than the demand although the latter is by no means inconsiderable. The only tannin materials which are exported are myrabolams from Cocanada and the ports on the Vizagapatam Coast, and Cutch, of which every year a few tons are sent from Negapatam. The export of myrabolams varies between 6,000 and 7,000 tons per annum and is of a value of about three lakhs of rupees.

The demand for tannin in Europe and America in the leather and dyeing industries is enormous and it is difficult to say, with the exception of myrabolams, why India has been unable to establish an export trade in this direction. A good deal of work has been done by Sir George Watt, the Reporter on Economic Products in this country, and by the Research Department of the Imperial Institute in London, to ascertain the value of the various Indian tanned stuffs and to make known the results of their enquiries. A considerable amount of information has been published in various numbers of the Agricultural Ledger and in papers which have been contributed to Trade Journals in Europe and America. Hitherto, however, the results have been unsatisfactory. This is probably mainly due to the fact that no serious efforts have ever been made to introduce Indian tanned stuffs to the European markets. The following extract from Mr. Hooper's paper already referred to may be quoted as a typical instance :—

"The Australian Acacias or wattles introduced into the Nilgiri Hills many years ago, have firmly established themselves, but nothing seems to be done as in Australia in collecting the bark as a commercial article . . . . The price of wattle bark is £10 per ton in English market and the market is supplied exclusively form Australia. A sample of bark from some *Acacia decurrens* grown on the Nilgiris was forwarded a few years ago to London for valuation. The reply stated that the sample of bark was in good condition and rich in tannin. But as buyers were in the habit of procuring their bark from a certain country in regular quantities there would be a prejudice in receiving it from a new source such as the East Indies, and there is nothing to guarantee their receiving a regular supply of the same quality. Tanners do not like to change the materials they employ, and English and Continental firms, after obtaining wattle barks from the Australian Colonies for nearly a century, are apt to look with suspicion upon other wattle barks . . . . Extracts have been made from these barks, preparations which hold the virtues in a concentrated form, and much better than the crude bark for exporting. There is a good market in Europe for well prepared wattle bark extract and the demand has been on the increase during the last few years."

No effort seems to have been made to ascertain what quantity of wattle bark could be procured in the Nilgiris annually and, without such information, it is hopeless to expect that private enterprise will make any effort to bring this source of tannin on the market. Government, as owners of the forests, and consequently of all the principal sources of supply of raw material, are most interested in this question; and it can hardly be doubted that if the Forest Department were to make a serious effort to place the Indian tans on the European and American markets, it would lead to

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considerable commercial success. The percentage of tannin contained in most raw materials is comparatively small, and for any commercial development it is absolutely necessary that the tannin should be extracted from the raw material and sent home in a dry state in the most concentrated form possible. Tannin is readily soluble in water but the evaporation of the extracts to dryness is attended with considerable difficulty as the concentration must take place at a low temperature. To raise the liquid extract to anything approaching the boiling point of water would lead to the decomposition of the tannin and the formation of useless compounds. The extracts must, therefore, be evaporated in vacuum pans. Even for experimental work such apparatus requires considerable capital outlay. It seems to me, however, that the difficulty might possibly be got over by evaporating the liquid extracts to dryness in shallow tanks somewhat in the same way as salt is extracted from the sea water in salt pans all round the coast of India. From February till June there will be little difficulty in carrying on such operations in the open air and if the prolonged exposure to sunlight does not affect the composition of the tannin, it is possible that in this method we may find a solution of the problem of cheaply preparing extracts of tannin from some of the more important tannin-yielding plants. Experiments in this direction will cost very little and I have arranged to have them carried out in Madras in connection with the chrome tanning trials which are now being made under my supervision at the School of Arts.*

Short notes on the more important sources of tannin in this Presidency are appended:—

(1) **Cassia Auriculata** (*Tam.* Avarai; *Tel.* Tangedu; *Hind.* Tarwar).—This is by far the most important source of tannin in the south of India and the bark contains from 10 to 20 per cent. of tannin, 12 per cent. being perhaps a fair average to take. This shrub is to be found in nearly all the districts of the Presidency; and the leasing of the right of collecting the bark is a source of considerable revenue to the Forest Department. The tannin yielded by this bark belongs to the catechol group and gives a greenish precipitate with ferric salts. Leather tanned with it is of a pale yellow colour but on exposure to sunlight it turns red. This defect is remedied by immersing the tanned skins in a bath of myrabolam extract.

The researches of the Committee of the Society of Arts on the decay of book-binding leathers showed that all catechol tannages are peculiarly liable to destruction by the action of sunlight, dry heat, gas fumes and traces of sulphuric acid from other sources, although in many cases more durable than the pyrogallol tannages, when exposed to mechanical wear and moisture, as is the case with shoe leather. This is peculiarly unfortunate as the greater part of the Madras prime tannages are purchased in Europe for conversion into book-binding leathers. The price of the bark fluctuates considerably and averages in Madras about Rs. 15 per candy of 500 lbs. or Rs. 67–8–0 a ton. For the tannage of skins it seems eminently suited,

* *Vide* note on page 48 *et seq.*

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but when used for hides the product is not altogether satisfactory. It is essentially a rapid tanning material and the leather produced is light, lacking in durability and easily affected by water.

(2) **Cassia Fistula** (*Tam.* Kone ; *Tel.* Rela ; *Hind.* Amaltas. Konnai or Rela, otherwise known as the Indian Laburnum).—This tree is very abundant all over the Presidency and its bark is largely used by native tanners. It produces a dark-coloured leather and is inferior, in every respect, to No. 1.

(3) **Terminalia Chebula** (Myrabolams) (*Tam.* Kadukai; *Tel.* Karakai; *Hind.* Hurrara).—This tree which is found all over India and Burma is by far the most valuable of all the Indian tannin-yielding trees. The bark contains a large percentage of tannin, but the unripe fruits are even richer and supply from 30 to 40 per cent. of pyrogallol tannin. Large quantities of myrabolams are used for finishing skins for export and they are valued at Rs. 15 to Rs. 20 a candy of 500 lbs. The best myrabolams come from the Salem District, but it is only from the northern ports on the Madras Coast that any are exported. It is not clear why this is so, as the trees are fairly abundant in many districts and the exports from Bombay are immensely more important than those from Madras. With alum myrabolams yield a yellow dye and with ferric salts they are largely used in the manufacture of ink.

(4) **Terminalia belerica** (*Tam.* Tani ; *Tel.* Tandra).—The fruit is one of the myrabolams, but it is inferior to No. 3 and is barely worth the cost of collection and carriage. It is occasionally exported to Europe and is probably used chiefly as an adulterant of ground myrabolams.

(5) **Terminalia Tomentosa** (*Tam.* Karramarda ; *Tel.* Nallamaddi ; *Hind.* Sain).—The bark of this tree contains a considerable quantity of tannin, but in the Madras Presidency it is not used except by fishermen on the west coast for dyeing and tanning their nets. The Inspector-General of Forests selected the bark as a subject for investigation with a view to the use of its extract as a tanning agent, and his experiments have been successful in so far as they have demonstrated that extracts used for tanning can be easily prepared ; but as yet, no practical result has been achieved, mainly, it is said, because of the high percentage of colouring matter and the large proportion of non-tanning soluble substances.

(6) **Casuarina Equisetifolia.**—Immense plantations of this well known tree exist on the coast sands near the sea, where it is largely grown by private individuals for firewood and by the Forest Department for the reclamation of sand dunes. The bark contains a considerable percentage of pyrogallol tannin and a red colouring matter which probably greatly discounts the value of the tannin it contains. Madras fishermen commonly dye their nets in a decoction of this bark.

(7) **Rhizophora Mucronata** (*Tam.* Kandal; *Tel* Uppupuma).—This is the well-known mangrove which is found in abundance on the muddy shores of tidal creeks all round the coast of India. The bark contains a variable percentage of catechol tannin. Attempts have been made to prepare extracts but without much success. Hooper states that considerable quantities of the bark are exported

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from the swamps that line the Perak coast; but in the Madras Presidency nothing is done with it.

(8) **Cæsalpinia Coriaria** (Divi Divi).—This plant was introduced into India from the West Indies in 1834, and it has been grown with a fair amount of success all over the south of India. The tree yields pods which contain a very high percentage of tannin. Proctor, in 'The Principles of Leather Manufactures', writes as follows:—

"The dry pods contain 40 to 45 per cent. of pyrogallol tannin, mainly Ellagitannic acid and would be a most valuable tanning material but for a liability to fermentation and sudden development of a deep red colouring matter. The causes are not well understood but apparently the risk can be materially lessened by the use of antiseptics. If used in strong liquors it gives a heavy firm leather but is principally employed as a partial substitute for gambier on dressing leather. Used in rapid drum tannage for light leathers, an excellent colour may be obtained. It is said to give an especially firm and glossy flesh. Leather tanned with it, even when outwardly of good colour, has often a bluish violet shade within—perhaps due to the development of a colouring matter allied to that of logwood."

Mr. Thorpe at Podanur, contributed some notes to the *Madras Mail* in September 1888, recounting his experience with divi divi as a tanning agent. He noticed that it gives a white colour to leather. The extracted matter imparts a reddish brown colour to the material which in the finished state becomes excessively streaked. It also possesses the undesirable property of gallic fermentation to an extraordinary degree which is a source of loss and annoyance to the tanner. The fermentation takes place rapidly under an increase of temperature even in the presence of antiseptics. Leather tanned with divi divi is influenced by the weather, having the peculiarity of being soft and pliant in the wet weather and firm in the dry season. The Agricultural Ledger No. 10 of 1899 contains a summary of all the information at present available regarding the development of divi divi cultivation in India.

(9) **Acacia Arabica.**—The well-known babul tree (*Tam.* Karuvela; *Tel.* Tuma).—Babul bark is the common source of tannin over the greater part of India. But in the Madras Presidency, although available in large quantities, it is regarded as inferior to avaram bark and is consequently but little used. The Agricultural Ledger No. 2 of 1902 contains a large amount of information regarding the economic uses of this widely extended and valuable tree. The bark contains from 12 to 20 per cent. of catechol tannin with a good deal of red colouring matter, and the pods about the same percentage of pyrogallol tannin. The tannin of the babul pod, Proctor states to be "the only known tannin which gives no insoluble compound with lime" and this fact is borne out by its extensive employment in the north of India as a bate for removing the lime from skins and hides as a preliminary to immersion in the tanning pits.

(10) **Acacia catechu** (*Tam.* Karangalli; *Tel.* Nalla sandra; *Hind.* Jhair).—Gamble, in his 'Manual of Indian Timbers', states:

"The chief product of the tree is catechu an important catechol tan. In Northern India, under careful preparation, it is produced in the form of 'kath', a pale cinnamon-coloured, biscuit like substance, which is valued as an astringent for chewing the betel and fetches a comparatively high price. This substance is found to be best given by those trees that have much white substance in the pores of the wood and is obtained by cutting

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the wood into chips and then by placing these chips inside a boiler with water below. As the water boils the steam passes through the chips and extracts the kath which is taken off as a sediment and dried. In Burma and in other parts of India the product of the tree is "cutch" which is a black shining extract soluble in water and used as a tanning material and exported to Europe for that purpose."

The method of preparation of cutch or catechu is given in detail in the South Canara District Manual, from which the following extract is taken :—

"The catechu trees are felled, and their branches and sapwood removed. The heart wood is then chopped into small chips about 1½ inches by 1 inch in size. About 2½ maunds of chips are put into an earthen pot containing a maund of water and boiled for two hours. When the active principle of catechu has separated from the chips, the decoction is strained into a trough placed at the foot of the still and immediately transferred to another vessel of which about half a dozen are placed on the ovens in a line. The chips once boiled are again mixed with the same quantity of water and again boiled. The process of boiling and straining is repeated six times and at every time the decoction obtained is strained and transferred to the pot containing the former decoction. The decoction is itself boiled again for about six or seven hours until it attains a dark brown colour and becomes gummy. It is then discharged into an open, shallow vessel and stirred by a ladle until it becomes semi-solid by oxidation, which it does in about five or six hours. It is made into balls, each of 1½ inches in diameter and the balls are rolled in ashes. The above preparation is said to produce 45 balls weighing 10½ lbs Here ends the work of the people—males and females of the Kudubi caste—engaged for the purpose. After receiving the balls from the Kudubis the contractor has to go through a further process of rubbing them five or six times for two or three days, heaping them up in an airtight covering of ashes, in which state they are kept for three or four days, and then giving them another rubbing, after which they are spread out in the shade to dry; when dried the above 45 balls weigh about 9 lbs. The balls thus prepared are delivered over by the contractor to the Forest Department, which pays him the price agreed upon, viz., Rs. 60 per candy, about 3,000 balls making a candy.

"The manufacture of catechu is carried on from about the end of December to the middle of March .It is confined to a jungle tribe, called 'Kudubis' who speak a dialect of Konkani and are said to have migrated into the district from Goa when it came under the sway of the Portuguese in the sixteenth century. When the Kudubi is engaged in the manufacture of catechu, he makes the site of the stills his home, the Kudubi woman being as much essential to the work as the Kudubi man. The work of the male ends when the has felled the trees and cut the heartwood into chips; all the rest of the process until the catechu balls are delivered to the contractor falling to the share of the female. The Kudubi gets from Re. 1 to Rs. 1-4-0 for every 100 balls manufactured or Rs 40 to Rs. 50 for every 4,000 balls which is generally the unit of account between the contractor and the Kudubi. During the three years ending with the 31st March 1894, about 49 tons of catechu were manufactured at a cost of Rs. 11,630 and the sale of these realised Rs. 25,857, leaving a total profit of Rs. 14,227 or Rs. 4,742 per annum to the Forest department. The manufacture of catechu gives employment to nearly fifty or sixty families of Kudubis, and the average monthly income of a family amounts to about Rs. 8.

"The catechu manufactured in South Canara appears to command a higher price than the product of Mysore on account of the careful and neat method employed by the Forest department in its preparation, the former

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fetches Rs. 135 per candy, while the latter scarcely realizes more than Rs. 100. The catechu manufactured in South Canara is chiefly sold in Mysore where it is eaten with *pan* (betel leaf) and administered as a medicine to women immediately after confinement."

(11) **Acacia dealbata** (silver wattle); (12) **Acacia melanoxylon** (black wattle); (13) **Acacia decurrens** (common wattle).—These indigenous Australian acacias were introduced on the Nilgiris about 1840 and have completely naturalised themselves.

Of the silver wattle, Gamble writes, that "it has been tried in many places in India and has succeeded fairly in some localities in the Himalaya, but nowhere as it as on the Nilgiris, where it has not only completely naturalised itself, but it possesses a power of spreading which might cause it, if not checked, to become a serious nuisance"; and of the black wattle, "this large and handsome tree is now a characteristic feature in the landscape at Ootacamund, Coonoor and Newera Eliya. It is easily raised and grown from seed artificially but bad naturally. The trees on the Nilgiris are very liable to be attacked by a species of *loranthus* which parasites in time kill their host." Again, of the common wattle: "This tree resembles much the 'silver wattle' but is not so grey, and it is not so common on the Nilgiris but is perhaps more common in other localities, as on the Himalayas. It is the principal one whose bark is used for tanning, though not the best. There can be but little doubt that the capabilities of the Nilgiris in exporting either harvested wattle bark for tanning or tanning extracts have not been appreciated as they should. In Northern India the search for marketable tans of regular supply has been prosecuted with energy for some time, but nothing seems to have been done on the Nilgiris where the wattle is a 'weed' and miles of it can be grown at a very small cost and cut over for bark on a five years' rotation."

Hooper state that the following results were obtained in analysing the barks of Nilgiri-grown acacias:—

Acacia decurrens	..	..	33·4 per cent. of tannin.
Acacia memoxylon	..	..	28·6 ,, ,,
Acacia dealbata..	..	..	17·8 ,, ,,

CHAPTER V.

MADRAS TANNERIES.

The equipment of a Madras tannery, owing to the entire absence of machinery, is of the simplest possible nature and can be described in a very few words. The only factors of any importance in determining the site are, first, an abundant supply of suitable water; and secondly, the possibility of getting enough labour in the immediate locality to carry on the various operations of the business. Native tanners attach great importance to the water-supply and there is not the least doubt that they are correct, although it is difficult to say why, with one water, perfectly satisfactory results are obtained whilst with

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another good work can never be done. The water of Madras tanneries has never been analysed or subjected to scientific investigation and the causes which produce often very anomalous results are entirely unknown. The water is invariably drawn from surface wells sunk to a depth of from 20 to 40 feet and such wells are always in the immediate neighbourhood of the tanyard so that the water is almost certain to be highly contaminated with organic matter. One well-known tanyard, whose brand has a very high reputation on the London market, draws its water-supply from a well close to a Paracheri and there is but little doubt that it is highly contaminated with sewage. The water is said to be specially good for removing the lime after the unhairing processes are completed; and it would seem as though the sewage contamination produced a natural bate. In certain places tanyards have been started and have done very well for a time but eventually the supply of water has changed in character and gradually increasing troubles on that account have finally led to the abandonment of the tanneries. In one instance brought to my notice, a very large tanyard in Coimbatore is sublet to three different tanners and each draws his supply of water from a different well The wells are no great distance apart, but the water from one of them enjoys an extremely high reputation and the skins turned out in that part of the tanyard supplied by this well are invariably of much better quality than those which come from the other sections of the yard where the water-supply is from other wells. A careful chemical and bacteriological examination of the water-supply to tanneries might possibly yield valuable results and it is almost certain that remedies could be found for the defects. At different seasons of the year the quality of the water varies considerably and after the rains it is generally not so satisfactory as in the dry weather. In tanneries near the coast the annual range of the temperature of the water is between 70° F. and 90° F.; and up-country, at an elevation of from 1,000 to 3,000 feet above the sea, the conditions are slightly more favourable, as in the cold weather the temperature falls to between 50° F. and 60° F. These high temperatures are extremely favourable to the development of bacteria and the rapidity with which putrefactive changes take place renders the work of tanning in the Madras Presidency one of extreme difficulty; and it is not surprising that the quality of the outturn varies enormously. Probably a good deal could be done by the intelligent use of disinfectants and sterilizers but it is more than doubtful if the extra cost which their employment would entail would be recouped. The Indian tanner knows the practical side of his business remarkably well and there is no doubt he often works at a profit where more scientifically trained tanners can only carry on operations at a loss.

A typical Madras tannery consists of tiled sheds built on the four sides of a square or rectangle with a blank wall externally and opening on the inside to a quadrangle. A wide doorway in the middle of one of the shorter sides of rectangle gives access to the tannery. One half is devoted to the reception of the raw materials and to the carrying out of the processes preliminary to tanning. The soaking pits are usually constructed below the ground-level along the outer walls. They are generally square in plan and three or four feet deep, built of brick and

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plastered. For the removal of the lime after unhairing, tanks of brick and plaster are usually built above the ground level with masonry aqueducts or channels to supply them with water. Skin tanning is invariably carried on in wooden tubs from 3 to 4 feet in diameter or more, and of about the same depth. Of these there are often more than one hundred.

In well arranged tanneries the coolies engaged in the preparatory processes are not allowed among the tanning tubs so as to avoid the risk of lime being carried over.

Hide tanneries are generally much smaller than those devoted to skins, but the arrangements are otherwise very much the same except that the tanning is often carried on in pits similar to lime pits. The capital outlay involved in setting up a tannery even of the largest kind is not much and there are numerous small tanneries in which a few hundred rupees would probably cover the whole cost. As a natural consequence the work is carried on in tanneries very irregularly, all the more so as the tanners themselves have very little capital and are almost entirely dependent upon advances wherewith to buy skins or hides and carry on their business. In the past the profits of the Madras tanning trade were very considerable and this led to a reckless system of advancing money which naturally ended in heavy losses and during the last few years the system of financing the trade has materially improved An enormous number of small tanneries have shut up and the greater part of the trade is now carried on in the larger tanneries under more competent management. The tendency, of late, has also been for the European firms to withdraw from the business and it is now very largely financed by wealthy Muhammadans and Hindus.

Since 1898 the export of raw skins has seriously affected the volume of the business done in goat skins and it is impossible to foresee how the spread of chrome tanning in Europe and America will affect the industry in this country. The natural course of trade is influenced by the protective tariffs imposed on manufactured goods by America and all continental countries and the English market is at the present time the only one which is open to a free import trade of Madras tanned hides and skins. Everywhere raw skins are admitted free of duty but in America raw hides have to pay a 15 per cent. *ad valorem* duty which is imposed for the benefit of the stock-raisers in the Western and Southern States. Madras tanned sheep and goat skins are subjected to a 20 per cent. *ad valorem* duty. This was apparently of no great moment till the chrome processes came largely into vogue and so long as the fashion for chrome tanned leather prevails, the Indian tanners are helpless. The whole of the export trade of the Madras Presidency is in tanned hides and skins and not in finished leather. The hides are tanned but not curried, and the skins are tanned but not dressed. In the chrome processes for the manufacture of leather, it is essential that there should be no break of continuity in the process of converting the raw material into the finished product. Once chrome tanned leather is thoroughly dried, it is difficult to wet it again and the dyeing and finishing processes must, therefore, be carried on as soon as the tanning is completed. There is very little market in

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India for high class leather or dressed skins and such demand as exists is supplied by imports from Europe. No great difficulty has been experienced in Bombay and Cawnpore in producing as good finished leather as can be obtained from the raw material available, but the supply is practically always greater than the demand and the industry is mainly dependent upon Government orders. If it were possible to find a market for finished leather or dressed skins, there is not the least doubt that it would have been done long ago; but the seeming want of enterprise on the part of those engaged in the trade in Madras is really due to a keen perception of the conditions of the industry. To curry leather or dress skins would never pay in Madras because owing to foreign protective tariffs it would be impossible to find a market for the finished material. It is an unfortunate fact that the Indian trade is at the mercy of foreign tariffs and it is doubtful if anything can be done to improve matters. The fiscal proposals which are now agitating the minds of statesmen throughout the British Empire may possibly effect some change for the better; but as yet, the part which India will be allowed to play has not been suggested, even in the faintest outline.

East Indian skins are an extremely important factor in the world's supply, but it is doubtful if they are sufficiently important to materially influence prices. The tanners of India would like to have an export duty on raw skins, but they are hardly likely to get it as India is not strong enough to force up the price so as to compel the importers in other countries to pay it. Even a comparatively small export duty will cause a great fall in the price of skins in this country and, though the tanners might gain, the stock owners would lose heavily. No charge of backwardness or want of enterprise can fairly be laid against the mercantile community in Madras engaged in the hide and skin trade, for the imperfect and unsatisfactory state of the tanning industry is due to causes entirely beyond their control.

CHAPTER VI.

TANNING.

The raw materials, whether skins or hides, are received at the tanneries mainly in a wet salted condition. In Madras and Bangalore, where a fair number of animals are killed in the slaughter-houses, certain tanners are able to procure a good supply of fresh hides and skins. Raw materials coming from other parts of India are received in the dry-salted or flint-dried condition. Skins, on receipt at the tannery, are carefully examined and those suffering from serious defects are rejected and either disposed of to other tanners who make a business of tanning rejections or else tanned separately for special markets.

Fresh skins are simply washed in plenty of water to free them from blood and dirt and as soon as possible are put into the lime pits. Wet-salted skins are soaked in pits for about 12 hours to remove the salt and the water is changed from time to time so as to thoroughly remove all salt. Dry salted skins require a longer period of immersion to get

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rid of all the salt and to restore the tissues to their natural state. Flint-dried skins are still more difficult to deal with as, owing to the complete desiccation of the pelt, water penetrates it very slowly and they often require mechanical treatment to thoroughly soften them. The practice of putting such skins into stale soaks is very unsatisfactory as although the softening action may take place more rapidly, putrefactive processes are set up and parts of the skin are often irretrievably damaged before the whole is thoroughly softened. In a hot climate like that prevalent in this Presidency, to avoid putrefactive changes, the period of soaking should be as brief as possible. Antiseptics are never used, probably on account of their cost, but it is by no means certain that they would not prevent a good deal of waste of substance which undoubtedly takes place in the soaking pits and would well pay for themselves in the improved condition in which the pelts would be when first placed in the limes.

It must be remembered that every process in a tannery contributes in some way or other to the quality of the final product and it is generally only when the final stages are reached that the results of defective treatment are apparent. It is, in consequence, often difficult to trace to its primary source an unsatisfactory result in the finished leather. Madras tanneries never attempt to produce sole leather and the great bulk of the lightly tanned hides which are exported are retanned for conversion into 'upper leathers.' Any criticism of the methods pursued by the Madras tanners must be entirely based upon commercial considerations and each process is to be considered suitable or otherwise in so far as it contributes to the production of a material which can be exported at a profit. In this connection, it may not be superfluous to point out that there is a vast difference between the quality of the hides and the quality of the skins with which the tanner has to deal. The former are undoubtedly inferior and, even though they were perfectly tanned, the final result could not be satisfactory in consequence of the inferiority of the raw material. On the other hand, the skins, to start with, are of excellent quality and well repay care and trouble in a tannery. The tanning of Madras hides is undoubtedly extremely defective and the final product is naturally of low quality, but it seems doubtful if any more profitable way can be devised for dealing with the great majority of the hides which are received in the tanneries. The general opinion of the experts, who purchase Madras tanned skins, is that the best of them are good enough for all practical purposes and it is doubtful if any changes in the methods of the tanneries would be productive of better results. All that is wanted is that the average work should be much nearer in quality to the best work and that there should be more care taken in grading the skins. Proctor, in his 'Principles of Leather Manufacture,' writes :—

"For some descriptions of hides, and notably for India kips, putrefactive soaks were formerly much employed, the putrefactive action softening and rendering soluble the hardened tissue. In India the native tanners soften their hides in very few hours by plunging them in putrid pools into which every description of tannery refuse is allowed to run. Putrefactive processes, however, are always dangerous, as the action, through changes of temperature or variation in the previous state of the liquor, is apt to be irregular and either to attack one portion of the hide before another, or to proceed faster than was expected. Hides are also frequently more or less

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damaged by putrefaction and heating during the process of cure, and these damages are accentuated in putrid soak. Hence, hides in the soaks require constant and careful watching and the goods must be withdrawn as soon as they are thoroughly softened, for the putrefaction is constantly destroying as well as softening the hides. It is possible that putrefactive softening is less injurious to kips and such goods as are intended for 'upper leather' than to those for 'sole' purposes, as it is generally considered necessary in the former case that a good deal of albumen and inter-fibrillary matter be removed and that the fibre be well divided into its constituent fibrils for the sake of softness and pliability; and thus the putrid soak, if acting rightly, accomplishes part of the work which would otherwise have to be done by the lime and the bate as the actual fibre of the hide seems less readily putrescible than the softer cementing substance."

These remarks shed a good deal of light on the 'soaking' question and it is probable that the tanner dealing with cow hides for export is right in not using chemicals in the soaks; but with buffalo hides, which when tanned are in considerable local demand for sole leather purposes, it is possible that a serious initial mistake is made in not taking special precautions to prevent loss of gelatine at the very outset. Practical tanners in Madras have undoubtedly experimented in this direction, but their experiments have been carried out in an unscientific way and no record of the results has ever been made public. Although the tanning industry is one of the largest in the Presidency, there has never been any co-operation among the tanners to promote objects in which they are jointly interested; and a narrow-minded trade rivalry prevents one man from helping another and all from working for the common good. Individual tanners have told me of their experiments and of their failures, but no case has ever come to my notice of a well devised system of experiments which would have yielded a definite solution to any problem which required solution.

After soaking, as soon as the hides and skins have returned to the natural condition in which they were when removed from the carcasses of the animals, they are immersed in the lime vats for the purpose of loosening their hair. For the tanner's purpose, fat lime or that containing but a small proportion of silica and alumina is best. Round the city of Madras the tanners mainly use shell lime which is exceptionally pure and well suited to their purpose. After the lime stone or shells are burned the quicklime should be carefully hydrated by mixing it with as much water as it will enter into chemical combination with. Care should be taken that no nodules or lumps of unslaked lime remain. It may then be stored in heaps or in pits covered with matting to prevent the formation of carbonate of lime by the action of the air; and in this state will keep in good condition for an indefinite period. The quantity of lime used in the vats is not of much importance as the lime is only slightly soluble in water and as long as there is sufficient quantity an excess of lime is no great matter. The practice in most tanneries seems to be to use about a cubic foot of slaked lime for every 100 skins and for hides in about the same proportion. The skins are kept in the lime pits for about 8 days and are turned over every day so as to ensure that the lime water has free access to every part of the skin. Hides are very similarly treated and in about ten days are ready for unhairing. New limes are not nearly so rapid in their action as old limes, mainly because the

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latter contain a large number of bacteria which assist in loosening the hair by their solvent action on the hair sheaths. The first liming process is complete as soon as the hair can be readily pushed off the skin with the thumb-nail. The unhairing is done on a sloping convex beam behind which the workman stands. The hide or skin is spread over the surface of the beam and with a slightly curved two-handled knife with a blunt edge, the workman scrapes off the hair with a firm downward stroke. The work requires a good deal of skill to accomplish it rapidly and without damage to the surface of the pelt. It is usually done by piecework and a trained cooly can do about 250 skins a day. The hair from hides and goat skins is sold for manure and usually fetches about Rs. 10 a ton. The wool from long-haired sheep is washed and dried, packed into bales and exported to England, where it is sold by auction and fetches about 3 annas a lb. After unhairing, the pelts are returned to fresh lime pits in which the skins are kept for 3 or 4 days and the hides for a longer period. This swells the pelt and makes it plump and firm and in a fit condition to be acted on by the tanning liquors.

Before immersion in the tan baths it is necessary, however, to get rid of all traces of lime and to clean the inner or flesh side of the skin by removing with a knife all fleshy and fatty matter. The fleshing is done on a beam similar to that used for unhairing, with a shorter and heavier knife the edge of which is kept sharp. The work requires great skill as the action is a cutting or shaving one rather than scraping; and carelessness in handling the knife would lead to cutting into the skin and probably irretrievable damage. Sheep and goat skin fleshings are of little value and are invariably sold for manure, but the hide fleshings are dried, squeezed into bales by hydraulic pressure and exported, chiefly to America for the manufacture of glue. After removal from the lime pits and before fleshing, the hides are generally thoroughly well washed in clean water and coolies get into the tanks and tread them well with their feet. This part of process has to be carried out very thoroughly if first-class work is to be turned out afterwards, and in the best tanneries and in yards where skins are pickled, great attention is paid to removal of the lime. After each washing the skins are scudded by being scraped with a blunt knife upon the beam, where by the lime and dirt still remaining in the pores of the skin are removed. In the process of unhairing it frequently happens that there is an undergrowth of short hair which it is difficult to remove with the blunt unhairing knife, and a sharp knife has to be used for the purpose. Even then, the last traces are difficult to get rid of and careful and frequent scudding are the most effective way of dealing with them. One of the greatest defects of Madras tanning is the fact that lime is frequently left in the skins to avoid the expense of removing it and to add weight to the finished product. Lime is not readily soluble in water and is removed with difficulty from the tissues of the pelt and it is usually the practice in most countries to employ chemical means for effecting it. In Madras practice, however, this is never done, while the system of bating prevalent in Northern India is not in use in Madras tanneries.

Since the American tanners discarded bark tanning in favour of chrome tanning for the production of glacé kid, not only have there

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been extensive shipments of dry salted skins from Madras, but orders have been placed by certain American firms for large quantities of pickled skins. The process of pickling involves all the operations we have just described and, when these have been completed, instead of immersing the skins in the tanning tub, they are pickled in a liquor, the composition of which is kept a trade secret; but the secret apparently is one of little value and pickling formulæ are well known. The following extract from an American book entitled 'Practical Tanning' by Lewis A. Fleming, describes what, I believe, is practically carried out in Madras: "The liquor in which the skins are pickled is composed of water, sulphuric acid and salt. It should have a sharp sour taste with some flavour of salt. About two quarts of acid and 50 pounds of salt for 100 medium and large skins make a good liquor. Enough water should be used to cover the skins well and enable them to be stirred about without being crowded. They should remain in this liquor from two to four hours and should be stirred about. The effects of this process are to cleanse and bleach the skins and to put them into such condition that they may be kept for an indefinite time without spoiling." After removal from the pickling solution the skins are packed in barrels for export and the majority of them are sent to Boston, U.S.A. It would appear that American tanners do not regard pickled skins with much favour; and though some firms still use them the demand is not on the increase. The freight on pickled skins which have to be packed in barrels varies from Rs. 7 to Rs. 8 per 100 goat skins as against Rs. 3 to Rs. 4 for tanned skins and Rs. 4 to Rs. 5 for dry skins. The difference is not serious and there is no doubt that the skins can be unhaired and fleshed and got ready for tanning, cheaper in this country than in America. But the American chrome tanners find that they get better results when dealing with the skins from the very beginning on their own premises. Pickling solutions vary in composition very considerably, and it is apparently essential that the tanner should be accurately informed of the treatment which the pickled pelts have undergone. Chrome tanning is a purely chemical operation which is carrried out in a very short time and to secure the best results it is obvious that the exact chemical condition of the pickled pelts should be known so that composition of the chrome solutions may be adjusted to produce the best results.

Tanning.—It will be convenient to first deal with the treatment of skins. The practice with different tanners varies somewhat, and the following description is from notes made while inspecting tanneries devoted to the production of first-class work. The tanning solutions are invariably made from the bark of *Cassia auriculata*, of which about 250 lbs. are used for every 100 skins. At the Pitty Tannery in Madras which represents the highest level of tanning practice in this Presidency, the skins are kept in the first bath for six days and are then taken out and scudded. In the second bath sheep skins are kept for four days and goat skins for five days. Again they are subjected to beam work and in the third bath both kinds of skins are kept for four days. In most tanneries only two baths are employed and the period of immersion in each is usually eight days and only in the better class of tanneries are the skins scudded between the two baths. After

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removal from the bark solutions the skins are practically tanned throughout. But unless subjected to further treatment, they rapidly change their colour on exposure to sunlight, and to prevent this occurring, they are treated for two to three days in a bath of myrabolams, of which about 50 lbs. are used for every 100 skins. This completes the tannage and the skins are now of a very light colour, almost white, which they retain permanently. On withdrawal from the myrabolams the skins are allowed to remain in heaps and then subjected to a final scudding process which removes the greater part of the moisture remaining in them. They are next lightly oiled with gingelly oil on the flesh side; and in good practice, about one pound of oil is used for every 10 skins; but in low class work, the skins are loaded with as much oil as they can carry, so as to increase their weight, and this over-oiling is regarded on the London market as one of the most serious defects of Madras tanning. The native tanner, however, looks at it in this light,—that skins fetch a very much higher price per pound than the cost of the gingelly oil and, therefore, the more oil he can get his skins to carry, the greater profit will he reap; and it is difficult to persuade him that in the long run the practice of over-oiling seriously diminishes the prospects of profit. The oiled skins are hung up in covered sheds for 24 hours to dry and are then spread over a wooden table and the grain side worked with a brass sleeker so as to smooth out wrinkles and stretch the skin uniformly in all directions. The skins are still harsh and stiff and to soften them they are staked. The stake consists of a broad steel blade fixed into an upright post about 2 feet above the ground and the skins are drawn across this blade, the cooly throwing as much of his weight as he can on to the skins. This makes the leather soft and pliable. Finally the skins are spread on a table with the grain side down and the flesh side is scraped or shaved and smoothed by rubbing with a rough brick.

Hide tanning.—The fleshed hides are put into tubs with layers of avaram bark between them and kept in a solution for three days, after which they are cleaned on the flesh side and then replaced for about five days in the same solution. From this they are removed to tubs containing a stronger solution of the bark in which they are immersed for about 10 or 12 days; afterwards they are treated for three days in a bath of myrabolams just in the same way as skins. On removal from the myrabolams the hides are hung up to dry and those for local use are well rubbed on the grain side with gingelly oil. Hides intended for export are further dressed on the flesh side with a mixture of tallow and cheap American flour with the object of preserving them and giving them a good appearance. In the matter of finally dressing, the practice, however, varies considerably in different parts of the country. Pallávaram and Coast hides are dressed with gingelly oil and rice cunjee, while Ránipéttai hides are not touched on the flesh side at all.

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CHAPTER VII.

LEATHER MANUFACTURES.

It does not fall within the province of this monograph to trace the subsequent history of the hides and skins which are exported from this Presidency in a half manufactured state. Hides are largely sent Home in execution of orders, the balance are sold by auction. Skins are mainly disposed of at the London auction sales. Prices vary very much from time to time, but over a long range of years there has been a steady upward tendency. Cow hides of from fair to good quality are worth from 11½*d.* to 14*d.* per lb. Light hides fetch higher prices than heavy, and calf skins most of all; the present price of the latter ranging from 17*d.* to 19*d.* per lb. Buffalo hides fetch from 9*d.* to 10*d.* a lb. The market classifications of skins are very numerous and the prices vary accordingly. Heavy skins have a much lower value per pound than light skins. Firsts are much higher in value than seconds and thirds. Sheep skins are usually cheaper than goat skins, but occasionally the reverse is the case. Madras prime tannages fetch the highest price, followed very closely by those of Dindigul, Trichinopoly and Coimbatore. Skins with a weight of 10 lbs. per dozen fetch about 3*s.* 6*d.* per pound on an average, whilst up-country tannages of the same description are not worth more than 2*s.* 6*d.* per pound.

Manufacture of Leather goods.—The only large leather factory in the Madras Presidency is the Government Harness and Saddlery Workshops in the Perambur Barracks. Captain Vanderzee, R.A., the Ordnance Officer in charge, has been good enough to furnish me with the following note:—

"GOVERNMENT HARNESS AND SADDLERY WORKSHOPS, PERAMBUR BARRACKS, MADRAS.

"This establishment was started in the year 1898; previously all harness, saddlery and accoutrements were manufactured in the Madras Arsenal, but owing to increasing demands for equipment and want of accommodation in the Arsenal, the Government Harness and Saddlery Workshops were started in the old buildings of the Government Gun Powder Factory at Vesarpaudy; this establishment is entirely distinct from the Arsenal, and like all the Indian Ordnance factories is directly under the orders of the Director-General of Ordnance, Simla. There is a permanent European establishment of two officers, a Head Overseer, four Warrant Officers, four Soldier Mechanics, a Civilian Foreman, a Civilian Cutter and a Gate-keeper. The officers themselves have to undergo a special training in the manufacture of leather, and the Head Overseer and Warrant Officers are men selected especially for the work they have to do. The Soldier Mechanics are all thoroughly qualified Saddlers and Collar-makers, and have all served as such for several years in their regiments or batteries before being appointed to the Ordnance Department. The Civilian Foreman is a man who has had a number of years experience in one of the largest firms at Home for the manufacture of harness furniture. The average number of native workmen employed daily is between 700 and 800; of this number about 400 are

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leather workers, over 300 are metal workers (forgers, moulders, brass and iron filers) and carpenters, and the rest peons and coolies. Practically all the mountings used for the harness and saddlery and accoutrements manufactured here are made on the spot.

"2. The total quantity of leather used is on the average annually about 310,000 lbs. of all sorts; of this about 270,000 lbs. is buffalo, 30,000 lbs. cow, 2,000 lbs. goat and sheep, and 8,000 lbs. buff. Buff leather is obtained from England, and all the other descriptions of leather from a Government contractor by name Adamjee Peerbhoy, who has a large factory at Sion close to Bombay, which is under Government supervision, and where the tanning and currying of leather for Government is carried out on the Home principles.

"3. Only Government work is allowed to be done in this establishment, and this consists of—

"The harness and saddlery for Horse, Field and Heavy Artillery, Mountain Artillery, British and Native Cavalry Regiments, all Pack Transport Equipment for the Supply and Transport Corps, Accoutrements for British and Native Infantry Regiments and Volunteer Corps, all leather work for Field Gun Carriages, all Gymnasia Stores and Miscellaneous Equipment.

"4. The leather is received in various forms, but the bulk of it is buffalo tanned and curried; buffalo tanned butt or sole leather is also received for manufacture of saddle seats, scabbards, etc.; cow tanned curried, for certain accoutrements such as Staff Sergeants' belts, Native officers' accoutrements, Sam Browne belts and for bandoliers, linings of horse collars, wallets, etc.; buffalo skirting, for flaps of saddles and certain scabbards; bellows for manufacture of bellows; engine hose, for manufacture of fire engine hose; black waxed leather, for manufacture of black accoutrements; goat and sheep skins, for linings of pannels, bellows, fencing jackets, etc.; buff leather, for buff accoutrements.

"5. The following arsenals are dependent on this establishment for supply of harness and saddlery, accoutrements, etc.

Bombay Command.

Bombay, Karachi, Mhow and Quetta Arsenals.

Madras Command.

Madras Arsenal, Trimulgherry Depot.

Burma Command.

Rangoon Arsenal, Mandalay Depot.

"So that, all the accoutrements, harness and saddlery, etc., supplied to the British and Native troops in the Madras, Bombay and Burma Commands are manufactured here.

"6. The value of the outturn averages nearly 7 lakhs of rupees annually."

"So far as the tanning trade in Madras is concerned, it is extremely unfortunate that the proposals for establishing a Government tannery in Madras should have fallen through. The project was actually sanctioned and so far put into execution that some machinery arrived in Madras; and for years the glacis of Fort St. George was adorned with two long Cornish, boilers painted red. It is not quite clear why the scheme was abandoned. Apparently it was thought that Bombay

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was a better centre for collecting a good supply of raw buffalo hides and no doubt the large slaughter-houses of that city yield a better class of hide than is ordinarily obtainable in Madras. But the quantity of leather required by Government is comparatively small and there should be no difficulty whatever in Madras in meeting the demand with hides of first-class quality. The manufacture of sole leather and the introduction of a proper currying establishment would undoubtedly have influenced local tanners, and might have led to considerable improvements in the tanning of hides.

The number of native leather workers employed is, as will be seen by a reference to the figures given in chapter II, very large, but practically, every family works for itself and there are no native firms or associations of leather-workers in the Presidency. Some of the large European firms in Madras manufacture saddlery, boots and shoes, but all the leather they use is said to be imported from England, and is either imported from England or brought down from Cawnpore. Cawnpore leather is of excellent quality and it would require expert knowledge to detect the difference. Quite recently, a fairly large boot and shoe factory has been established at Coimbatore by some Eurasian tanners who are trading under the name of Clifton and Company. Most of their work is done with country leather which they tan and curry themselves; and as the managers of the business have acquired a practical knowledge of the trade in England, they are able to turn out very excellent leather.

The output of the chuckler is very varied. Under skilled supervision and supplied with good materials, he turns out excellent work. Boots and shoes, harness and saddlery, can be obtained in Madras, of local manufacture but of imported material as well made, in respect to finished appearance and durability, as one could wish for. But beyond the influence of European ideas in regard to the appearance of things, the work done by the native chuckler is rough and clumsy, and there are no leather workers in this Presidency whose productions have at any time reached a standard of excellence in the least degree approaching that which is comparatively common among metal and wood workers. The reason, no doubt, is the extreme inferiority of the raw material and the uselessness of expending labour in the decoration of articles which must necessarily be of an ephemeral character. Excluding agricultural implements, the most commonly manufactured articles are sandals and shoes. These are made almost everywhere but in certain places the trade is more highly developed than in others. Muhammadans seem to indulge in the most expensive footwear and very elaborate specimens costing as much as Rs. 6 each have been sent me from Nagore near Negapatam. These are known as *chadas* and the more they creak the better they are liked. The soles are of buffalo hide very thick and stiff, and with large heels, and the various thicknesses are sewn together with hanks of cotton. The uppers are made of dressed sheep skins dyed red and ornamented with patterns sewn on them in coloured cotton. The shoes are canoe-shaped, the toe portion being something like a Venetian gondola, and the sides at the heels curve upwards and outwards in local disregard of the anatomy of the foot. The shoes most commonly worn all over the country are made with comparatively light soles with the toes turned up and curled over and the heels turned down, giving the wearer at all times a very slipshod

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appearance. Red leather is almost invariably employed and many crude devices for decorating it are adopted. The fashions of different centres vary considerably, as for instance, shoes made in Trichinopoly are rounded off in the front and brought up to a point, whilst a similar article produced in Anantapur has a perfectly square toe, fully 3½ inches broad. As a general rule, the feet of natives are larger than those of Europeans and the distinction becomes more marked when the comparatively light build of the former is taken into account.

There is so very little fit about the ordinary shoe or sandal, which is commonly worn, that the luxury of the shoes made to order is practically unknown, and natives, as a rule, are content with anything that approximately fits them and which they can slip off and on with ease. The average price of native shoes is from Re. 1 to Rs. 2 a pair; but shoes are more or less a luxury and are only worn by comparatively wealthy people who are able to get about in carriages of some kind or other. Those whose have to walk about the roads sometimes wear shoes of inferior quality with thicker soles but the majority use sandals which are of much more substantial construction so far as the soles are concerned, and which cost from As. 12 to Rs. 1-8-0 a pair. Elaborately ornamented sandals of a much more expensive kind can be obtained and are used by richer classes. Native dress shoes are often very gorgeous and are very elaborately embroidered with gold, so that they are expensive articles and may cost as much as Rs. 50 or 60 a pair.

When the chuckler starts making shoes or sandals, he purchases the leather and skin which he requires in the bazaar and, taking it home, first proceeds with a preliminary currying operation. The leather is damped and well stretched and dyed with aniline, the usual colour being scarlet R.R. of the Badiche Aniline Soda Fabrick. This is purchased in the bazaar in packets and is dissolved in water to which a little oxalic acid has been added. The dye is applied with a piece of rag on the grain side and allowed to dry. After drying, tamarind paste is applied to the flesh side of the skin and the latter is then rolled between the hands so as to produce a coarse graining on the outer side. In making the shoes, the leather is usually wetted and moulded into shape on wooden moulds or lasts. As a rule, nothing but cotton is used for sewing and the waxed ends of the English cobbler are entirely unknown.

The largest consumption of leather in this Presidency is for water bags or kavalais which are used for raising water from wells, and for oil and ghee pots, in which the liquids are transported from one place to another. Of irrigation wells there are in this Presidency more than 600,000 and though some of them are fitted with iron buckets, nearly all of them have leather bags with leather discharging trunks. The buckets hold from 10 to 50 gallons of water and are generally made from fairly well tanned cow hides, though for very large buckets buffalo hides are sometimes used. The bucket is roughly semi-cylindrical in shape and suspended from an iron ring. At the bottom is a hole about 8 inches in diameter which leads into the discharging pipe—a leather tube 5 or 6 feet long, the open end of which is attached to a rope. It is unnecessary to describe the working of the common mhote and it is now of more importance to emphasise the very hard treatment which the leather receives from the hands of the ryot. Alternately

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wet and dry, and seldom or never greased, the leather perishes very rapidly; and where the bucket is in use every day its life is seldom more than six months and during the latter part of that time it requires frequent repair which is a source of much annoyance to the ryot, as he is entirely in the hands of the village chuckler; and the latter, knowing that his services are indispensable makes the most of the situation. It may be safely assumed, taking into account the fact that many of these *kavalais* are only used at intervals during the year, that on the average a new water bucket is required once a year at each well; and, allowing for wells fitted with iron buckets or other means of lifting water, it is probable that at least one million hides per annum are used for this purpose. The value of a tanned hide is from Rs. 3 to Rs. 4 and the kavalai complete in the hands of the ryot, usually costs him from Rs. 6 to Rs. 9. The expenditure, therefore, on water bags can hardly be less than 40 lakhs of rupees per annum.

The number of oil and ghee pots in use in the country is very large, but owing to the nature of their contents their life is a long one. The pots are generally approximately spherical in shape and closed by a wooden bung which fits into a short neck. The use of leather vessels for this purpose is however on the decline as it is found much cheaper and more convenient to store oil in the ubiquitous kerosine-oil tin and it is not improbable that eventually the industry will die out as it has done in other countries.

The range of work of the country chuckler is not very extensive. Besides leather straps for wooden sandals, he makes crude harness for the ryots' cattle, including leather collars from which numerous bells are frequently suspended, leather whips for the cattle drivers, ornamental fringes for the bull's forehead, bellows for the smith and small boxes for the barber, in which to carry his razors. In some places leather ropes are used for various purposes and it is customary to attach big coir ropes to the bodies of the larger temple cars by leather harness when they are drawn in procession through the streets of the town or village in which they are situated. Drumheads, tom-toms and similar abominations are made from raw hides by village Vettians and Chucklers. The drums are often very large and are transported upon the backs of elephants, horses, bulls and camels. For them raw hides are required but for the smaller instruments sheep skins are sufficient. The raw hides are shaved on the flesh side and are then dried. The hair is removed by rubbing with wood ashes. The use of lime in unhairing is not permissible as it materially decreases the elasticity of the parchment.

The following information furnished by Mr. S. Vaidyanadha Aiyar, the Head Master of the School of Commerce, Calicut, gives some details regarding leather work in Malabar, and should be taken as typical of the information which can be collected for each district:—

"ITEMS OF LEATHER WORK MADE BY THE CHUCKLERS AND MAPPILLAS WHO ENGAGE IN THE TRADE.

"(*a*) *Boots and shoes of country make and English pattern.*
"(*b*) *Harness making.*

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'(*c*) ***Repair work.***

'(*d*) ***Native shoes*** (*ceruppus*).—These are of the special pattern peculiar to Malabar; and are largely used by all classes of the Hindu and Mappilla communities. The Arabs who visit this coast once a year purchase a considerable number to take back with them. The price of a pair varies from Rs. 1-8-0 to Rs. 5. Those with ornamental gold lace work cost from Rs. 10 to Rs. 50. These shoes are generally used by well-to-do Mappillas. The white of the egg is used to give a creaking sound to the shoes. This work is mainly done by Thole-perunkollans and Mappillas, and the latter show more skill in finish and ornamental work.

"(*e*) *Knife-sheaths.*—Almost every Nair, Teeyar and Mappilla carries a knife about one foot in length, and there is a demand for these leather sheaths, the price of which varies from one anna to 8 annas. These are made by Panans as well as by Thole-perunkollans and Mappillas.

"(*f*) *Leather baskets* are also made and they are largely used as receptacles for carrying pepper, paddy and other grains.

"(*g*) *Winnowing fans.*—These are made of leather and are used in pepper and paddy yards in godowns.

"(*h*) *Muttu ceruppu* (*clogs*) are leather shoes with wooden soles. These are largely used during the rainy season and cost from As. 12 to Rs. 2."

CHAPTER VIII.

PROSPECTS OF THE TRADE.

In concluding this survey of the Madras tanning trade it seems desirable that some attempts should be made to depict the present condition of the industry and to indicate the general tendency of the forces which affect the tanner and leather-worker in the South of India. The position of the skin dealers and vendors of hides is a roseate one as the value of the raw commodities in which they deal is ever tending upwards. This is not due to any action on their part but simply to the fact that in the markets of the world the value of the raw material is steadily rising. It is impossible that they should influence matters much in any way but there is no doubt that they could do something to secure better qualities of hides and skins. If branding of cattle could in any way be discouraged it would add enormously to the value of the hides. But it is probably hopeless to expect that any material change in this direction will take place, and in fact the hides are deliberately ruined in order that they may insure the animals from greater dangers.

In connection with skins, what is most wanted is that more care should be taken in curing them immediately they have been taken off the animals. Putrefactive processes set up with such extreme rapidity in these hot climates that many skins are badly damaged through carelessness in this matter. Turning to the tanner, there is no doubt that the small man is in a bad way and there is a distinct tendency for the ryots to dispense with the services of the village tanner and to sell their skins or hides to dealers and to buy such articles of leather as are necessary in the bazaar. On the whole, this

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must be regarded as a satisfactory result. The Chucklers and Madigas have now become agriculturalists and have given up their hereditary occupation of spoiling good material. It is distinctly advantageous to a country that its natural resources should be used in the best possible way and there is no doubt that throughout India the modern tendencies of the trade in hides and skins are wholly favourable. The disturbing element in the tanning trade at the present time is the chrome process and till a final verdict has been pronounced upon the value of the peculiar properties of this leather, it is impossible to say what the future of the trade will be. It is certain that the present demand for raw goat skins will continue and that the best of them will be sent out of the country. But it is not improbable that the possibilities of utilising chromed goat skins have been fully developed and that therefore the present condition of things may continue for a considerable period provided that it is not disturbed by changes in the fiscal policy of the Nations who are engaged in this trade with India.

The position of India in regard to chrome tanning is described at some length in an article on 'Tanning in the Madras Presidency' which I lately contributed to the *Indian Review*, and from it I extract the following passages :—

"The cause of the demand for raw skins is entirely due to the popularity of a new kind of leather which is now largely produced in America and on the Continent by one or other of what are known as the chrome processes. Chrome tanning was first experimented with fully 50 years ago, but no great progress was made with it till within the last ten years and it was only in 1895, that chrome tanning was thoroughly established in America on a firm commercial basis. The process may be described as a purely chemical one requiring a considerable knowledge of chemistry and an accuracy in manipulation which can only be expected from specially-trained men.

"The product, chrome-tanned, or more properly speaking, 'tawed' leather is, in many respects, superior to leather made by any other process and for certain purposes it has probably displaced vegetable tanned leathers permanently. Compared with other tannages, chrome produces a leather which, whilst exceedingly soft and pliable, possesses great strength and is practically unaffected by water. Moreover, it is less liable to stretch than other leathers and this important property makes it specially suitable for the manufacture of boots and shoes. Chrome tanned leather may be boiled for several minutes with impunity or exposed to strong heat for some time without risk of injury; and these valuable properties add greatly to its wearing qualities. Once chrome tanned leather is thoroughly dried, it is exceedingly difficult to wet it again and it is therefore necessary that the finishing process should be undertaken as soon after the tanning as possible. This is a matter of great importance to this Presidency because hitherto the tanners have not attempted to produce for the export trade anything more than half finished goods and it is practically impossible to introduce chrome tanning unless at the same time arrangements are made to complete the process of converting the skins into marketable articles. The opinion is almost universally held amongst those engaged in trade in Madras that it is impracticable to produce finished goods cheaply enough and at the same time of sufficiently good quality to enable them to be exported at a profit. Attempts have certainly been made both in Madras and Bombay and they have ended in failure.

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"**At any rate**, there is no doubt that the successful establishment of an export trade in chrome leather from India can only be accomplished in the face of great difficulties which may be briefly classified under three heads:—

"(1) *Want of Capital.*—A chrome tannery with the accompanying leather dressing shops requires a large amount of machinery and apparently can only be successfully worked on an extremely large scale. In America one firm is said to be capable of turning out 3,000 dozen finished skins a day and another to have a capacity of fully 2,500 dozen skins, so that these two firms alone could easily deal with all the exports of this Presidency. Of course it will not be necessary to establish tanneries in this country on that gigantic scale; but it will be necessary to invest a large amount of capital with dubious prospects of success and under such circumstances it is quite hopeless to think that the capital will be forthcoming.

"(2) *Want of intelligent labour.*—The modern tannery very largely employs machinery in all its processes in place of hand labour. In India, undoubtedly, so much machinery would not be of any advantage provided that skilled hand labour were available at reasonable rates. For certain kinds of work machines are absolutely essential as they turn out work far better and far cheaper than any hand labour can possibly do. But, on the other hand, in countries like America where labour is expensive, machines often supersede hand labour with a very much narrower margin of advantage and when those machines are introduced into Eastern countries where labour is cheap, the advantages, derived from their employment entirely disappear. It would therefore seem probable that a judicious combination of machinery and hand labour would enable tanning and leather dressing to be carried on with advantage; but the difficulty is to obtain a sufficient amount of skilled hand labour. Only the very lowest castes will do manual work in a tannery and even they, as a rule, only take it up when they cannot obtain employment elsewhere. At the present time the general complaint of Madras tanners is that labour is very scarce owing to the fact that the season has been a good one and there is plenty of agriculturul work to be obtained. In bad seasons labour is plentiful but at other times it is insufficient. Practically, tanning is monopolised by poor Muhamadans and Pariahs and if any improvements are to be introduced or changes made, either these people must be educated and their intelligence developed, or a supply of labour must be obtained from other sources; neither of which alternatives seems practicable on a large scale at the present time.

"(3) The third cause which it is said would prevent successful chrome tanning in this country is the hot climate. But the evidence offered in favour of this statement is, by no means, conclusive. So far as I have been able to ascertain it is entirely based upon the fact that in America chrome tanners find it difficult to secure uniform results in the hot weather and they have had to either give up work or use artificial means for cooling their solutions. This may be perfectly true in the huge American tanneries and with the methods of working there employed, and yet have no bearing whatever upon the conditions which prevail in this country. In a small way, chrome tanned leather has been produced in India and the failure to turn out a marketable article seems to be due to defects in finishing rather than to anything wrong in the tanning.

"Even supposing that all these difficulties were successfully overcome, there yet remains the difficulty of finding a market for the finished skins. It is absolutely certain that the tariffs imposed by continental nations and by America, if not already sufficiently high to exclude Indian manufactured leather, will be immediately raised so as to prevent the possibility of finding a market in any of these countries. The only open market is in London which is already fully supplied and competition is

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practically impossible so long as foreign nations can ship their surplus productions for disposal there, at any price they will fetch. There only remains the local market in India and that at the present time is too insignificant to be of any account though, as we shall presently see, it is in the development of the home market that the most promising results may be expected.

"The export of raw skins from Madras which commenced in May 1899 is a matter of such great importance to this Presidency that it seems desirable to bring together all the statistics available and these are summarised in the following table, in which the numbers given relate to bales and in the case of pickled skins to casks :—

Year.	Tanned goat skins.	Tanned sheep skins.	Raw goat skins.	Raw sheep skins.	Pickled skins.
1898	21,417	7,633	*Nil.*	*Nil.*	*Nil.*
1899	19,903	8,042	996	...	2,347
1900	19,986	10,457	3,397	257	1,730
1901	12,135	9,501	6,507	404	4,312
1902	12,982	8.173	5,732	280	1,540
1903 till 1st September			1,752	203	1,334

"From this table it will be seen that so far chrome tanning has only affected the goat skin trade as the export of tanned sheep skins and tanned hides of all classes still remains about the same. The various brands of Madras skins are well known in the London market and all the prime tannages, especially those prepared from slaughter-house pelts, have a high reputation and command good prices. They are chiefly used for expensive book-binding and fancy leather work; and, although the Committee appointed by the Society of Arts to report upon the deterioration of leather used in book-binding pronounced a very unfavourable verdict upon East Indian skins, yet it is unlikely that chrome tanning will in any way affect the demand for these skins, as chrome tanned leather is unsuitable for conversion into highly priced fancy leathers. The great bulk of the trade, however, is in what is known as 'up-country tannages' and as these will only take a black dye they are almost entirely employed in the boot and shoe trade and here they come into competition directly with chrome tanned skins. It has been established beyond doubt that chrome tanning produces a superior leather and it is therefore merely a matter of time before the whole of the trade in tanned goat skins except those of superior quality will disappear. So far, only trial consignments of raw sheep skins have been sent to America, and as there is a much greater difference between the freight on tanned sheep skins and dry sheep skins than there is between tanned and raw goat skins, and as the value of sheep skins is only about one-half that of goat skins, the margin to cover the cost of tanning in America is much smaller and it is therefore probable that Madras tanned sheep skins will still continue to hold their own in foreign markets . . . ."

It seems to me, then, that any efforts to improve tanning in the south of India should first be directed to improving the supply of leather for local consumption. I propose now to only deal with one class of leather goods which are in very large demand, namely, buckets

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for lifting water from wells. Probably not far short of a million hides are used every year for these articles alone Generally, they are good hides which would command ready sale if they were available for export. The life of a leather bucket at a well is not a very long one and if the bucket is in use every day does not average much more than six months and probably all through the Presidency it is always necessary to provide a new bucket for each water-lift, once a year. The buckets are made of well tanned leather, but constant immersion in water and exposure to a hot sun cause them to deteriorate very rapidly and they are a constant source of trouble and annoyance to the ryots.

The introduction of chrome tanned leather for these buckets promises to be a great improvement and at the risk of repeating what I have already said, I propose to quote, from 'The Manufacture of Leather' by Mr. C. T. Davis, a paragraph in which he describes the characteristics of chrome leather. He says:

"Chrome leather has special and peculiar qualities which distinguish it from all other kinds of leather and these special features cause it to be a superior fabric for all the purposes for which leather is used. It has often been stated that chrome leather is water-proof, but this is not a proper term to use in connection with it: it should more properly be called non-absorbent. All kinds of leather produced with tannin absorb water readily, like a sponge, while chrome leather does not absorb water but resists it or sheds it, like the feathers of a duck. In fact it is a difficult matter to thoroughly wet chrome leather when it is once dry. Again, water and air are the agencies in nature which promote decomposition and decay, and as tannin and hide substance are both organic materials, and when combined, as is the case in bark tanned leather, and subjected to the process of wetting and drying, such leather will, eventually but surely, deteriorate and become rotten. Chrome leather, on the other hand, being a combination of an inorganic material with the hide substance and subjected to the same process of wetting and drying shows no effect whatever. In fact, the oftener chrome leather is wet and dried, the softer and more flexible it becomes. Even subjecting it to boiling water apparently has no effect upon it while any sort of leather produced with tannin and placed in boiling water is utterly destroyed. Moreover, chrome leather is of much lighter weight than bark leather and this is a decided advantage for almost all purposes for which leather is used."

Accepting this as a fair statement of the properties of chrome leather, it is evident that as compared with bark tanned leather it is an almost ideal substance for water bags. Chrome tanning must be introduced, or eventually, our tanning trade will largely disappear, and as we have already seen that it is practically hopeless at the present time to try and manufacture finished leathers suitable for foreign markets, it seems to me that we might well commence by endeavouring to turn out a chrome leather suitable for these water bags. The chrome leather, at first, might not be of the highest possible quality but it would be so much better than the leather in use at the present time that it ought to find a ready sale even at considerably enhanced prices. In this Presidency where tanning materials can be procured at extremely low prices and where the chemicals used in chrome tanning will have to be imported, it is probable that the cost of chrome tanning will always be somewhat greater than that of the tanning now in vogue. But if the material turned out is much superior

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and more durable, this is not likely to prove a great difficulty in the way of making chrome tanning a success. From the very outset it should be possible to produce marketable goods and in course of time, as experience accumulates, the quality may improve and ultimately it may be found possible to manufacture leather of sufficiently high quality to enable it to be used for many other purposes. As the first step therefore in any attempt to bring Madras tanning once more on a level with that of the rest of the world attention should be directed to the manufacture of goods for the local market and the manufacture of leather for water bags promises to yield the most successful results. The innate conservatism of the ryot may at first prejudice him against any new material, but he is so thoroughly well acquainted with the unsatisfactory character of the only leather he can at present obtain, that I do not anticipate that there will be much difficulty in getting him to use chrome tanned leather bags when their advantages have been satisfactorily demonstrated.

It would be possible to enumerate many other purposes for which chrome tanned leather might be used with advantage in this country, but at the outset I think it is desirable to limit the range of experiment as much as possible and the field opened out by the water bag industry is quite large enough to begin with. Chrome tanned water bags may reasonably be expected to last two or three times as long as the ordinary bark tanned bags now employed, and if they come into general use there is no doubt that the consumption of hides for water bags will be greatly reduced. This would mean a considerable saving to the ryots engaged in well cultivation, and would throw a large number of first-class hides on the market for export and will probably increase the external trade of the country by an amount which may be vaguely estimated at something over ten lakhs of rupees per annum.

In other directions it does not seem likely that much can be done to improve the prospects of the tanning trade in this Presidency. The opinion is strongly held, and rightly so I think, that the best Madras bark tanning of skins is capable of little or no improvement, but much might be done to raise the quality of the up-country tannages, which are at present over-limed and far too heavily weighted with oil. Sole-leather is not produced in the Madras Presidency but large quantities are made in Bombay and Cawnpore and there appears to be no reason why a thoroughly satisfactory material should not be produced in Madras. In fact on what is practically an experimental scale it is so produced and it only requires energy in finding markets for it to establish a fair business.

Allusion has already been made in chapter IV to the possibilities of increased trade in the raw tanstuffs which abound in this Presidency and in referring to them again, attention is directed to the reports which have been published in the Agricultural Ledger No. 9 of 1899 on the tannin yielded by *Cæsalpinia digynia*, the cultivation of which in suitable localities will probably be more profitable than that of the allied species *Cæsalpinia coriaria* (Divi-divi) with which experiments have frequently been made.

The question has often been raised as to whether Government could materially assist the local tanning trade by providing means for the technical education of those engaged in it. There is no doubt that

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much interesting work could be done by a scientifically trained tanner and it is possible that there might be some practical outcome from his work; but if he were placed at the head of a leather trade school similar to the well-known institutions at Leeds and Bermondsey, it is almost certain that he would get no *bonâ fide* students. The actual tanners of the Presidency are almost without exception, an illiterate class and any changes in the methods of tanning will have to be forced upon them. It is quite certain that they will never change of their own accord; and it is equally certain that they have no desire for, nor capacity to assimilate technical education. It must not, however, be imagined that the possibilities of improving the tanning trade have been neglected. The volume of the business is so large that it is keenly watched by experts all over the world and, except that they take no interest whatever in the local markets, one may rest fairly confident that nothing of importance has been overlooked and that the interests of India are not suffering, because the investigation of her resources in the tanning and leather industry is mainly in the hands of foreign experts.

16*th December* 1903. A. CHATTERTON.

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ADDENDUM.

In the interval which has occurred since the preparation of the above monograph and the revision of the proofs for the press, the manufacture of chrome leather on an experimental scale has been successfully carried out in the School of Arts in Madras and a considerable number of hides have been tanned and converted into chrome leather. It was represented to the Madras Government that it was desirable that the experimental manufacture of chrome leather should be attempted, and a sum of Rs. 2,000 was placed at my disposal for that purpose. It is unnecessary to detail at length the various experiments which have been carried out, and it will suffice to say that most of the well-known methods have been tried and, as a result, it has been found that the following process yields chrome leather suitable for water bags and such class of work :

The hides are procured from local tanneries in a state ready for immersion in the tanning liquor, but special precautions have to be taken to secure complete removal of the lime after the unhairing and fleshing. Both fresh hides and pickled hides have been tried, and I am inclined to think that the pickled hides yield a rather better leather, but it is doubtful if the improved quality is worth the extra expense. The tanning solution consists of chrome alum dissolved in water and rendered as nearly neutral as possible with sodium carbonate. The addition of sodium carbonate produces a rapid effervescence of carbonic acid gas owing to the presence of free acid in the chrome alum, and some care is necessary to avoid adding more carbonate than is required to neutralise the acid as any excess produces a precipitate of chromic oxide which is useless for tanning purposes. A comparatively weak solution of the neutral chrome alum is put into a drum in which the tanning processes are carried on. From time to time the solution is strengthened, and as a rule it takes from 36 to 48 hours to complete the tannage of an average hide. This is ascertained by making a clean cut in a thick part of the hide, and the section exposed should be of a uniform blue colour throughout. The hides are then removed from the drum and piled in a heap for about 12 hours, so that the surplus tanning liquor may drain out of them. They are then washed in clean water and fat-liquored in a drum. A good deal of trouble was experienced in finding a suitable fat liquor, but after many experiments it was found that castor-oil made into an emulsion with a solution of carbonate of soda and mixed with water yielded the best results. No cheaper fat liquor could well be devised, and in a drum it was readily absorbed by the leather. On the completion of fat liquoring, the hides are hung up to dry for a time and then, whilst still moist, are sleeked on the grain side, then well staked and finally scoured on the flesh side. The resulting leather is very soft and of considerable tensile strength and, so far as it has been tried within the time available, has proved perfectly satisfactory for water bags and water buckets.

The sale of the leather is making steady progress, and there seems to be little doubt that it is eminently suited for the purpose. The durability of the leather can only be tested by lapse of time, but so

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far, everything points to our anticipation being realised in the fullest possible manner. The process of tanning is exceedingly simple, and there seems to be no reason why any native tanner should not be able to carry it out after receiving a short course of instruction. The chemicals employed are cheap and the actual cost of tanning does not exceed that of bark tanning.

There can be no doubt that the experiments have successfully demonstrated the possibility of chrome-tanning hides in Madras and of turning out a quality of leather eminently suited for water bags, and it simply remains to introduce these water bags to the notice of the ryots and demonstrate to them the advantages which they possess over the ordinary-bark tanned leather bags. This is a much more difficult matter and will surely take time, but it is certainly worth while persevering with, as the ultimate saving to the agricultural community will be very large. It will be necessary to give the hides tanned in the School of Arts at least a year's trial before any practical steps can be taken to establish tanneries in various parts of the country. It has accordingly been decided to continue manufacturing chrome leather at the school on a small scale for some time longer; but it is hoped that the tanners of the Presidency will soon take the matter up and relieve the Education Department of the necessity of entering into extensive manufacturing operations to demonstrate, on a commercial scale, the possibilities of a new process.

29*th March* 1904. A. CHATTERTON.

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